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AV Communication Review

AUDIO VISUAL

Some New Frontiers for Newer Media

C. WALTER STONE

A Computer-Based Laboratory for Automation in School Systems

DON D. BUSHNELL AND JOHN F. COGSWELL

Audiovisual "Engineers"?

HENRY A. BERN

JULY-AUGUST 1961

AV Communication Review

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ERRATUM

The editors wish to correct an error in Vol. 9, No. 3, Current Teaching-Machine Programs and Programming Techniques, page 40. The incomplete version of the first item in the program sample from Review of High School Chemistry, General Atronics Corporation, Bala Cynwyd, Pennsylvania, should read:

9. All the atoms of any one particular element are exactly alike, but are unlike the atoms of every other element.

   Elements are the simplest substances because any one individual element contains _____ atoms.

   a. a variety of
   b. different
   c. similar
   d. identical

The editors regret this error.

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TITLE VII RESEARCH ABSTRACTS AND ANALYTICAL REVIEW: INSTALLMENT I — A-1

Some New Frontiers for Newer Media

C. WALTER STONE

This article was first given as an address to the annual convention of the Department of Audiovisual Instruction, NEA, April 28, 1961, at Miami Beach, Florida. As a speech by the director of the Educational Media Branch, U.S. Office of Education, Dr. Stone's remarks carry special significance for the readers of this journal and the profession it represents. Their publication in this issue of AVCR*—with the printing of the first 16 Title VII research abstracts—comes at an opportune time.*

READERS OF THIS JOURNAL know from professional experience how far the goals of education have been advanced during the past three years and how much good work has been accomplished as a result of the boost given by the National Defense Education Act. Of particular interest is the stimulus given to improved uses of the newer media provided by Titles III, VI, and VII, a stimulus which has become increasingly evident as schools and colleges across the country have re-examined their instructional requirements and have taken steps to harness our communications technology directly for the benefit of education.

Details of the Title VII story are familiar. As of today, the situation is this: some 137 research grants have been awarded in support of new media research and experimentation. Seventy-six contracts have been let to support dissemination activities which are helping nation-wide to tell the story of research, experimentation, significant teaching programs and practices, and of the newer media themselves. Thus far, approximately $8.7 million have been obligated or expended to carry out the purposes of Title VII. Results of the 16 research studies completed and of the many dissemination programs now underway show the promise of this work.

A brief assessment of what is already being achieved by the Title VII program adds up in my judgment to these eight points:

1. It is helping to develop a sounder base of research evidence and experience in the new media for the guidance of teaching and learning practices.

2. It is searching out and reporting norms and goals in each related service area and is helping to establish new directions and priorities.

3. It is helping to develop a blueprint for the future upon the basis of which a sound educational television enterprise may be erected.

4. The same may be said for the development and use of teaching machines (and, indeed, in varying degrees for all new media).

5. It is giving a major stimulus to the flow and use of pertinent research information.

6. It is launching a new approach to reporting on educational media as such by experimental development of a national index and related guides to materials.

7. It is helping to coordinate the efforts of associations, foundations, and other agencies working in the field.

8. It is building new bridges to other lands through reporting on research and experimentation beneficial to the United States.

We believe the effects will be enduring.

These are some bare statistics and results of the Title VII program to date. But to appreciate the real meaning of the Title VII story it must be reviewed in light of the difficult educational situation in which we find ourselves today.

In less than a century a stable, relatively isolated and independent agrarian unit of society has been catapulted into an atomic or space age, serving, and in turn being served, on a global basis by many new institutions. As members of an increasingly interdependent (as well as internally competitive) system of nations, communities, and organizations, we have acquired new goals and responsibilities which relate to education.

For example, more of us are now alive and we are living longer. All of us have new wants and some expanded requirements for use of the world's food, shelter, and other resources. And as a corollary of this, or more accurately as one consequence, we face a new urgency in our struggle for survival. A paradox is that at this same time we have developed new and almost infinite capacities for productivity as well as for destruction.

While the headings under which we normally list the content of our basic formal educational programs have changed very little, the need

for change is considerable. The fields of mathematics and science and also of the social sciences are expanding rapidly. Our concern with the arts and humanities must take new and different forms consistent with the changing world. There are new amounts of content to be grasped in every field, and new relationships must be established between and among our educational disciplines. In short, the character of the age in which we are now living means that archaic educational machinery must be scrapped or rebuilt. Nostalgic and charming as it may once have been and well-fitted though it may still be to sustain the mood and pastoral themes of early America, the little red schoolhouse and all it implies is today as much an anachronism as the kerosene lamp or horse and buggy. New facilities are needed: new buildings, new kinds of equipment (transistorized, miniaturized, and perhaps solar and nuclear powered) to make possible implementation of new modes of teaching and learning and acceptance of new responsibilities on the part of the community, of our teachers, and of students.

Fortunately, and to our credit, a new division of instructional labors is now occurring between early and later school years and between our homes and schools. Some new approaches to building design and to the general environment of learning are being proposed. Creative new groupings of students are being established. The school clock and calendar are being revised. New teaching resources are being gathered together in new collections and distributed and used in new ways to achieve new educational ends. We say that there is a new form, a new structure, and a new process becoming visible in American education. Television, the teaching machine, and the language laboratory are taking their places as basic aids to learning in American schools and colleges.

However, there is one basic problem which must be resolved before the educational benefits of such changes will achieve full effect.

Even today, thousands of youngsters in parts of the United States are shuffling ill-shod feet under worn, uncomfortable benches in schoolrooms hardly fit for the name. At the other end of the scale, there is the school of tomorrow, examples of which you have seen for yourself. American education is not equal and its opportunities are not equivalent.

Informed educators and citizens agree that our fiscal traditions and support levels for public education are generally antique. Changes recommended for the public school calendar (for example, the 11- and 12-month school year), the length of the school day, split shifts, more

schooling at night, teaching large classes by television, etc., have been proposed and tried out to ease the situation. But it has not been shown that such measures provide satisfactory long-range answers to overcrowding or to any of our more fundamental economic problems in education.

To sum up on this point, we still do not know how and/or simply are not willing to pay as we go for public instruction. We haven't developed practical alternatives to Federal support. New media solutions (for example, educational television) have been proposed and in some cases are proving helpful. But, in the long run, these cannot and should not be regarded primarily as economic aids.

The plain fact is that we've got to do some new thinking about our dollars and education. We are now living in a world divided by more than a hundred years from place to place in educational thinking and customs (though only miles and minutes apart in space), and the survival of all of us could depend upon instant recognition of common dangers and an intelligent common response. The spirit of the National Defense Education Act was derived from a premise that the only really sound means of insuring our way of life and those ideas in which we believe, including peace among nations, depend upon educational opportunities being made as widely available as possible and on the quality of instruction. Events just 90 miles away from Florida reinforce the point. Federal assistance and leadership without control seem to me to be our only practical answers.

No one need fear that the solutions to our problems in education will be found in totalitarian uniformity of educational design, methods, or curricula. If we simply come to admit the fact that ignorance in state or county "X" may produce failure, disease, and crime in city "Y," and if in one way or another this inter-relationship may be considered in our future economic as well as general cultural and social aspects of educational planning, then we shall have taken some big steps forward.

As for newer media and, indeed, the whole corpus of our educational methods, techniques, and distribution systems, a more important problem than the cost of education is the need for building and sustaining quality. The main contributions of newer media will be in this area, and progress is being made. I'd like to talk about this progress in relationship to Title VII.

In recent years we have acquired much new knowledge of the media of communication and their effects on instruction through research and

experimentation, and we are now making use of that knowledge. But I think it is true to say that a more important result of Title VII projects completed to date has been the stimulus given to the use of research as a way of thinking about educational problems and as a tool for defining and helping us to resolve the growing number of our educational dilemmas on a regional, national and international, as well as on a local, basis.

Here may be another measure of progress. The professional field in which we work is today better knit together. Important agreements have been reached concerning relationships which should exist in service arrangements for using the newer media.

The nature of our field of specialization is gradually being redefined and broadened. Those primarily concerned with textbooks now talk to and have dinner (at least once in a while) with friends who work with film. Film people talk to broadcasters, and both of these, at least sometimes, appear willing to shake hands with colleagues who are working with teaching machines, who, in turn, are most closely associated with friends in the textbook area. And so a new circle is being drawn around newer media endeavors for the purpose of improving quality in American educational efforts.

The partnership roles of the Federal Government are better conceived and understood than they have been in the past. Federal efforts to encourage the coordination of similar field programs without control, through supporting pilot projects and demonstrations, stimulating research and experimentation, filling gaps in information—these things are being done by the U. S. Office of Education and they appear welcome. They also seem to be leading in the direction of improvement.

The continuing and vital relationship which must exist between Federal efforts and those put forth by states, local communities, and institutions must never fail to be acknowledged. Neither can we afford to neglect the promise of state compacts and Federal assistance for regional programs which can help to balance inequivalency and encourage the pooling and sharing of resources needed so badly by local systems. I am not thinking now only of physical resources and dollars. Perhaps the most important aspects of regional cooperation will have to do with creative thinking and the joint planning of projects.

Here is another look toward future progress. In the past, it has been very difficult for us to capitalize on experiences gained in the field of language teaching and in use of broadcast facilities by European and

Asian countries. These experiences, however, transcend our own, importantly in some respects, and we can learn from them. New methods of training, new uses of film and broadcast aids, a "leapfrogging" of more traditional educational institutions and methods which have not yet evolved make of some of our newer nations "living laboratories" which we as a nation may observe. We should and we will go farther in our efforts to exchange on an international basis productive thinking and resources for the benefit of education.

Next, a comment on future technical developments. With specific reference to Title VII, let me say that in recent months some of us may have become especially interested in what is called the systems approach and, incidentally, many Title VII projects reflect this interest. I think there is some danger that unless we make very clear our definitions of and our actual intentions with respect to the meaning of a "systems approach," we could mislead others into thinking in terms of producing Rube Goldberg devices and multi-media approaches which may be inappropriate if not completely irrelevant to educational problems. (The systems approach represents a way of thinking about the total process of teaching and learning and resources which may be employed to carry through to completion a given educational program.* It must not be conceived as a kind of mystical panacea derived from new technology.)

As for newer technology *per se*, despite some problems which might develop, I believe that in the future much closer relationships should be established between those who manufacture equipment and those who produce materials which are to be used with such devices. At present there may be too many incompatible devices and materials emerging which are unlikely ever to be used with much real understanding and benefit in our schools and college classrooms.

Continuing this line of thought for a moment, during the past two decades much has been said about our need to provide a major flow of dollars to support research and development on the part of educational equipment manufacturers in order to stimulate a breakthrough in educational communications technology. I think we have come to a point now when perhaps under the existing provisions of Title VII, something can and should be done about this by the U. S. Office of Education, as well as by such organizations as the Educational Facilities Laboratories.

* See the following article by Don D. Bushnell and John F. Cogswell for a technical description of one example of the systems approach.

The Federal Government, foundations, and other funding agencies which support pilot ventures in materials production, must be ever alert to the danger of seeming to assume control of content. Still, specialized teaching materials are so badly needed in so many subject fields where initial production and distribution is not economically feasible for private agencies, that here, also, a contractual stimulus should be considered. This may be another proper role for the U. S. Office of Education to assume under existing provisions of Title VII.

Important but little used materials produced in special fields—for example, medicine, chemistry, physics, and the arts—are normally too expensive to reproduce for each educational community and may be used profitably in too few cases to warrant normal commercial support. Publicly supported state or regional centers for distribution and handling of such materials would seem warranted.

Looking farther into the future implementation of Title VII, I would anticipate increased Federal attention to nation-wide support of state surveys and special studies, these to be followed by plans for demonstrations at local, state, and regional levels, perhaps including centers for exchange of ETV materials and experimental production efforts, and inservice training centers for improved uses of the newer media. I believe that special attention should and will be given to television as its unique educational promise is recognized and that it must be counted an integral part of the nation's inventory of resources.

As for new media specialists, we must in the future work to achieve an even greater degree of professional unity. This will require a more unified approach to recruitment, training, and work performance. We must improve our definitions and statements which set forth professional aims and objectives to insure integration with the total field of education. We must, in every way we can, encourage and specify research, experimentation, and demonstration as fundamental and sound approaches to the definition and resolution of educational planning and development problems. It is vital that, in addition to know-how and dedication, we work in our programs of professional education to provide those sorts of knowledge which are not confined to technical capacity or to the character of the media with which we work (we do not need more splinter-group technicians), but which represent knowledge of educational processes derived from continuing study and appraisal of the relevant literatures of psychology and sociology as well as more basic subject matter. (This thesis was dominant in the

seminar conducted by the Department of Audiovisual Instruction in March 1960 on "The Education of the AV Communication Specialist" and subsequently reported as Supplement 2 of AVCR, Vol. 8, No. 5.)

Finally, in any listing of qualities and prerequisites for professional personnel, we must identify the need for having some convictions which are more deeply rooted than in dollars for staffs and new technology. The glitter of project gold and novelty have in recent years appeared too often as chief measures of prestige. Mere enlargement of the field in which we work, recruitment and training of new technical personnel, the filling of schools and colleges with new resources and facilities will not necessarily and in themselves lead to realization of our basic aims.

And now here is a word of caution to the profession based on some Title VII experience. Increasingly, we are noticing some difficulties in sustaining the integrity of educational research programs because of pressure for more demonstrations. Significant and necessary though such demonstrations may be and we do feel very keenly the need for more, they can be pushed to the point where it becomes difficult to achieve sympathy for and appreciation of the contributions of research. It should be remembered that meaningful demonstrations grow out of the new body of information which research provides. Without such a "growing edge," demonstrations become sterile and redundant just as instructional practice may stultify without the stimulus of demonstrations. Research effort supported by Federal funds is a national resource. The importance of continuing Federal participation in research must not be forgotten as a matter of national interest.

One additional comment on research—in our enthusiasm for getting things done, for trying out new teaching materials and devices, we must not discount nor compromise the quality of research effort. This is not the time or place to report in detail on the serious lack of quality evident in too many research proposals submitted under Title VII. But I would like to say to you frankly that lack of significance, inferior design, seeming ignorance of what is needed, not to mention poor financial planning, are common characteristics of a majority of the proposals we receive. Unless this pattern changes soon (and we shall try some direct means of assisting in this), the strength and continuity of new media research programs may be jeopardized.

Now by way of summary, I should like to say that although the basic educational problems we face as Americans have been rehearsed for you many times, our goals remain incompletely defined on all levels of

education. We still serve inadequately special groups. Equal opportunities for instruction are not yet available across the nation. We are not yet certain of emphases, of what to teach, to whom or how. And this is our situation at a time when the need for professional knowledge and conviction was never greater because opportunities to serve the cause of education constructively were never more wide open and the urgency of taking action has never been more immediate.

Pressed with immediate and practical problems of recruiting and training manpower to serve all areas of American life, we could all too easily yield ground in our battle to emancipate individuals from ignorance as an important goal of formal education. It's time for change!

But there is one kind of change against which all of us must guard and that is change which could threaten a fundamental principle regarding the locus of responsibilities for our educational enterprise. The Federal Government is constantly aware of the need to protect the local interests of the schools.

As specialists in the media fields, we should not allow ourselves to be content simply with linking our own cultural interests and/or technical talents to our capacity for the development of artistry in the translation and transmission of educational messages. Specialists in the media field must always work cooperatively with those chiefly responsible for curriculum development, and for other aspects of the educational program. The dangers here are obvious. We already suffer too much in some places from educational thinking which seems to be based on a form of *ars gratia artis*.

In our calling, we must work with industry, with our colleagues in the field, and with all the professional groups concerned, to stimulate breakthroughs in both the quality and quantity of educational communications equipment and technology. We must support more pilot ventures for the production of new and desperately needed teaching materials. While sustaining appropriate Federal and state relationships, we must seize upon and, where and whenever necessary, create new opportunities for regional cooperation, planning, exchange of materials, production, and special services. We must approach and utilize research as a way of thinking in education.

As professionals in education we must share with our colleagues responsibility for helping to determine sound educational ends as well as improving our means and media. To put this in more specific terms, we must share responsibility for development of sound policy and pro-

grams concerned with employment of television, teaching machines, and other media in education, and avoid becoming advocates when needed proof is lacking.

We must prevent any drying up of support for research efforts even as we develop an increased number of experiments and demonstrations at local, regional, and national levels.

We must find our way through the jungle of public and private rights and royalties to new instructional materials and equipment and bring some order out of chaos.

We must recruit and train a body of manpower capable of meeting the service requirements of the communications technology of tomorrow and we must do this rapidly with all professional groups appropriately having interest in the field.

We must counter organized opposition to intelligent uses of newer media.

We must study the roles which new media can play and then profit from these studies in developing improved services to the gifted and the handicapped and the isolated.

We must overcome our international immaturity.

We must stimulate regional planning and coordination in a manner consistent both with our traditions and with economic realities.

We must tell our story to the public to develop understanding and appreciation in ways never before achieved in education and we must find more ways to translate the results of research into significant practice, something also never really successfully achieved except in such fields as medicine and the physical sciences.

We must consider the development of national leadership training efforts and use all media to tell the story of these efforts.

Perhaps most important of all, we must map and carry out a coordinated information program through our respective professional groups, frankly calling public attention to misuses and abuses of the newer media as well as to the educational opportunities they afford.

In short, we must first be thinking Americans; second, educators; and specialists, third. The circumstances and requirements of the age in which we live endorse such recommendations, the end results of which may be, as we have said before and we will say again, more and better learning for more people in less time through improved uses of newer media for the benefit of our free society.

A Computer-Based Laboratory for Automation in School Systems

DON D. BUSHNELL
AND JOHN F. COGSWELL

The authors are members of a research project on automated education in the Research Directorate of the System Development Corporation. Prior to joining the Research Directorate, Mr. Bushnell directed a man-machine system training program in two NORAD Air Defense Divisions. Dr. Cogswell was recently in charge of a section responsible for the development of training innovations for the SAGE System Training Program.

THE WEIGHT of time and numbers on our educational institutions has already been well documented. Straining to teach more students with proportionately fewer teachers and required to re-educate an increasing portion of the working population, schools and higher institutions have been under pressure to develop a modern educational technology.

Finn (6) has indicated two major trends in this development: (a) a mass instructional technology such as educational television, and (b) a technology for individual self-instruction primed by the development of automated teaching devices. He predicts that these developments are going to "hit education with a million-pound thrust."

The problem has been to refrain from a piecemeal approach to a technology of education with the emphasis on some educational objectives to the exclusion of others. Melton (10) said that in the development of a modern technology, a taxonomy of education should guide the evolution of new techniques so that proper objectives of education are served. Certainly the manufacturers of technological equipment are not in the position to consider objectively the merits of their technology for achieving these goals. Nor is the science of learning prepared at this time to lead an orderly procession of innovations into the classroom.

It is the educator who is faced with the problem of making decisions about new technologies. These decisions are best based on developmental research conducted at the point of application. It is a problem of research because the

evaluation of any new educational media should be in terms of measurable achievements. And it should be conducted at the point of application, as Hilgard (8) states it, "because educational research requires a strategy of participation and decision-making so that proven results will become a part of practice."

But how does the educator avoid the piecemeal approach to the development of a new educational technology? How does he achieve the right perspective for the integration of the newer educational media with the marketing world, the huge resource foundations, and the science of learning making claims for this or that innovation?

It was largely the consensus of last year's symposium at Stanford University[1] that a *systems approach* to education was needed to avoid the pitfalls of over-emphasis on any one media. A systems approach to education as Carpenter put it:

> . . . would provide: A conceptual framework for planning, orderly consideration of functions and resources . . . and the kinds and amount of resources needed, and a phased and ordered sequence of events leading to the accomplishment of specified and operationally defined achievements. (p. 75)

SYSTEMS APPROACH TO EDUCATION

Any arrangement of men and machines bound together to produce a specifiable output can be referred to as a "system." The output of an educational system is, of course, educated people. Thus Pythagoras and his stick with which he taught theorems to students by drawing in the sand is an early man-machine system; just as a university with its physical plant, its teachers, blackboards, books, card punch machines, etc., is also a man-machine system.

Generally speaking, the output of a modern educational system is a result of a complex of interrelated factors. The systems approach to this complexity is to functionally describe the men and equipment in the system; analyze both the informal and formal communication channels and the informational needs of those involved in the system (in this case educators, students, and parents); determine costs of the present system requirements; and relate costs to the output of the system.

Two methods of systems analysis have been in general use. Neither of them is entirely new to education. One involves mathematical modeling and the other, simulation techniques.

Mathematical Modeling

Kershaw and McKean (9) of the RAND Corporation did an exploratory study for the Ford Foundation to assess the possibilities of making quantitative comparisons of elementary and secondary school systems. They conclude that data collected from a large sample of schools can result in a meaningful comparison of the effect of different input variables on educational achievement. Innovations, such as educational television; changes in a school system, for example, increasing teacher salaries; and differences between schools, i.e., pupil-teacher ratios—all of these can be costed and related to output measures like standard test scores. Kershaw and McKean propose that this kind of statistical analysis will be of the sort

[1] *New Teaching Aids for the American Classroom.* (A symposium on the state of research in instructional television and tutorial machines.) Stanford: The Institute for Communication Research, Stanford University, 1960.

"that can help administrators and others choose improved educational systems."

The University of Pittsburgh with the American Institute for Research (11) has undertaken a study which, among other things, will relate various school characteristics to the performance of pupils on specially designed achievement tests. Similar to the study proposed by Kershaw and McKean, this analysis will be based on certain mathematical models to help determine which school characteristics produce significant differences in pupil performance. About 500,000 pupils in approximately 1400 secondary schools will be included in the sampling.

Development of Simulation Techniques

Although comparative statistical analyses of different schools should yield important information, it is clear that this approach does not provide a solution to the developmental problems associated with the application of new technology.

Military operations were among the first to recognize the advantages of system analysis and research for the development of vast automated weapons systems such as the Strategic Air Command and the Air Defense System. But because of the complexities of their systems, it was found that the use of mathematical models for the description of the variables in the system often defied their system analysts. It was found that *simulation* of the system, sometimes with the aid of a digital computer, offered an alternative to abstract analysis.

The Systems Research Laboratory (4) at The RAND Corporation, was used to simulate a model of an Aircraft Control and Warning Squadron. The simulated environment of radar targets, weather reports, air base and weapons status reports, and messages from adjacent control centers was genuine enough for crews to respond to in a realistic manner. The interactions of the men and their uses of communication channels under simulated war conditions were studied. The experiments that ensued not only demonstrated the value of simulation for systems research, but also indicated that crews actually learned and improved their operational capability in the simulated environment.

Thus simulation provided a means for both systems research and training. In fact, the Air Defense Command considered the training value of the technique so great that they contracted with the System Development Division of RAND (later to become the System Development Corporation) to train all of their air defense crews throughout the country with the methodology developed in the Laboratory.

Today most prime military systems have associated with them a secondary system (simulated) established for the express purpose of studying and improving the prime system.

Of more immediate interest to educators are the simulation studies carried out under the sponsorship of the University Council for Educational Administration (13). Several universities have used films, filmstrips, tapes, and printed materials developed by the Educational Testing Service for simulating administrative problem situations. These materials were used for research on patterns of successful behavior of school administrators. An in-basket technique was used to present secondary school principals with routine problem situations. Tapes and films presented circumstances demanding immediate action.

Although the UCEA program was developed primarily for research, it was reported that those who experienced the simulated situations felt the simulated materials held promise for instructing school administrators and for providing a better basis for selecting principals.

Simulation and Contextual Research

Comparing different means of accomplishing educational objectives through simulation techniques is not unlike contextual research, i.e., research done in real education settings. The differences are primarily in the scope of study and in control. Contextual research has generally not dealt with the wide range of alternatives, decisions, and interrelations that must be considered if the output of our educational systems is to be improved. Nor has it generally dealt with sufficiently purified variables to afford meaningful interpretation.

On the other hand, systems research utilizing simulation techniques has the advantage of a realistically simulated environment and a good measure of control. System simulation and research methods could lead to the optimization of new technologies in the realistic setting of the classroom for the following reasons:

1. They yield information about unpredictable effects that might be costly if they occurred for the first time in a real school.

2. They permit the training of educational personnel and the development of organizational procedures appropriate to the new media.

3. They prevent a piecemeal approach to the development of an instructional media since new technologies are tested in a total plan of instruction.

4. They enable the educator to become a member of the research team which would demonstrate the desirability of new technologies to those who make decisions about their acceptance in education.

5. They allow the projection to future configurations presently not existing by simulating and testing the functions of proposed models.

Need for Simulation Laboratories

A system simulation research approach requires a facility in which simulated schools, materials, and situations can be used and experimentally studied. This facility can be as simple as a single office where in-basket techniques are used, or it can be as complex as the Systems Research Laboratory developed for the RAND study.

What is needed, said Carpenter at the Stanford symposium, are research centers in which a wide range of research with educational media could be accomplished. These centers would be well housed and well equipped for advanced research on educational innovations and learning processes and would provide sustained support for systematic and programmatic research. Because simulation research provides realistic tests under realistic conditions, the centers could "communicate" applicable information about new media, new practices, and research results to the educational community.

Carpenter agrees with an earlier statement by Melton (10) made at a Northwestern University symposium.[2] Melton

[2] *Can the Laws of Learning Be Applied in the Classroom?* (A symposium on the relation between a "science" of psychology and a "technology" of education.) Evanston: School of Education, Northwestern University; May 1958.

said there is a critical need for laboratories where the science of learning and the technology of education are developed side by side, and where the sampling of subjects (both curricular and human) is representative of those whose learning is to be managed in schools.

An adequate facility for developmental research on educational media should permit the experimenter to control many variables. The flexibility for both mass and individualized media should be realized in different teaching situations for different subject materials. Implications of new techniques and new data for the total educational system should be capable of investigation. Finally, it needs to be emphasized that the ultimate test of educational models, even though developed and evaluated under realistic conditions in a systems simulation laboratory, is their trial in actual school systems.

A COMPUTER-BASED LARORATORY

A computer-based laboratory for the study of automation in school systems (designated CLASS), is now in construction at the System Development Corporation. This laboratory, like those contemplated by Melton and Carpenter, should help educators move in the direction of greater communality between the science of learning and the technology of education.

The CLASS facility in the large man-machine Systems Simulation Research Laboratory at SDC will be devoted to educational research and development of educational technology in a systems context. The laboratory permits the integration of (a) individual student automated instruction, (b) group instruction (both automated and conventional), and (c) centralized data processing for administration, guidance, and planning functions. This educational system is now

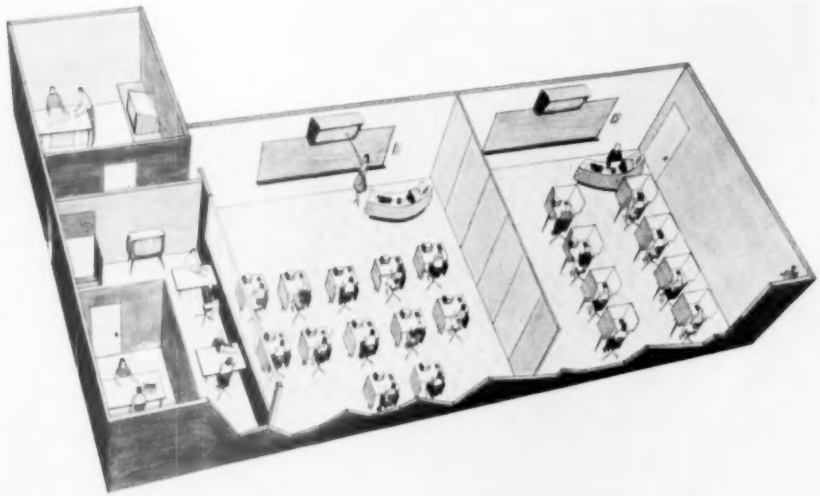

FIGURE 1. *The CLASS facility incorporates an administrative area, hallway, combined observation and counseling area, and a large classroom area divided by a sound attenuated folding wall.*

in construction and should be completed by Fall of 1961.

Flexibility has been the primary aim in the design of CLASS. The central control of the laboratory is exercised by a large digital computer, the Philco 2000. In addition to providing multivariable control, permitting individualized auto-instruction, and providing detailed recording and computation, the computer facilitates flexibility of experimental design. Various innovations in instructional mode, administrative information processing, and counseling procedure can be provided by computer-program modification. The facility itself will consist of an administrative area, a counseling and observation area, and a large automated classroom area. In Figure I, the classroom area has been divided into two rooms by a sound-attenuating folding wall. This wall makes it feasible for two teachers to be simultaneously teaching in two different subject matter areas and in two modes of automated instruction. When the wall is recessed, a large group area is obtained.

The observation area incorporates a small counseling room. The desk in the counseling room will have an alphanumeric typewriter connected to the computer, for recording and reporting diagnostic data and for calling up information needed by the counselor during an interview. All of this data will be stored on magnetic tape along with the student's educational record (continually updated by his daily performance), previous school record, aptitude measures, and other relevant information.

In the observation area, observers will be able to monitor the behavior of students and teachers in the classroom through a one-way vision glass. In the event that the wall is used as it is in Figure I to divide the large area into two classrooms, a closed-circuit TV camera and monitoring unit permits observation of the remote classroom. Microphones placed in the classroom(s) will also permit observers to monitor and record the auditory behavior of subjects.

The administrative area will be the focus for the planning, administrative, and logistical functions normally associated with a school system. Initially, the off-line printer associated with the computer will serve as a general purpose print-out facility for the administrative area. Thus the computer will provide the means of recording and calling up various kinds of information such as daily attendance, student progress, etc. In addition, the computer can be programmed to perform the tasks of registration, class scheduling, financial accounting, enrollment forecasting, etc. At a somewhat later date, it is anticipated that additional data processing equipment such as a card reader, printer, and electrical typewriters tied to the computer will be installed. As greater flexibility in information processing is required, other components will augment the system.

The classroom area has been designed with 30 square feet of space allowed for each of the 20 students. This of course includes walking space, coat racks, and cupboard area in addition to the student's desk and chair. Cabling attachments for the electronic components in the classrooms are unexposed because of a false-floor construction.

Individual Mode of Auto-Instruction

Individualized automated instruction, as described by Coulson and Silberman

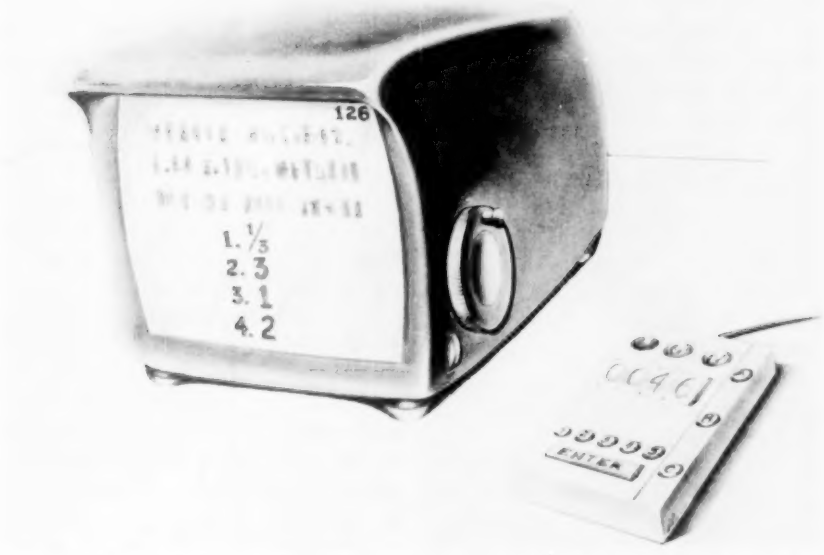

FIGURE II. *The student's instructional components consist of the film viewer and the student response device.*

(5), is made possible through the electronic components on each student's desk. Each student has the two components shown in Figure II—a film viewer and a response device connected through a buffer system to the computer.

The student begins with a sequence of educational items or frames, as displayed on his film viewer. All of these items have been carefully written, sequenced, and student edited. Some of the items will be multiple-choice questions testing the student's knowledge of the subject material. The student responds to the question by pressing one of five translucent plastic keys on his response device. When a key is pressed, a light inside that key is turned on. After the student is certain of his selection, he presses the "Enter" bar, transmitting his choice of response to the computer memory. The computer analyzes the response and gives appropriate knowledge of results by lighting a second light above the response key corresponding to the correct multiple-choice option. A red or a green light at the top of the response device can be turned on by the computer also indicating correctness of choice.

Every item number presented to the student via the film viewer is registered within the computer control unit. Each student response is checked for correctness and the appropriate feedback message is transmitted. A cumulative record of the student's performance on each of the topics is kept. These performance measures include the student's response time, error count, and pattern of errors. If a student's performance falls below a certain level for a particular topic, the student is "branched" or detoured to a special set of remedial items on that

topic. The student may be taken through the entire remedial routine, or may be brought more quickly back to the basic series if he performs well on the remedial set. If he makes a good record on any given topic, demonstrating by his overt behavior that he understands that topic, he may not be branched at all but may proceed rapidly, skipping some material as he proceeds.

When the student has read a frame of material, responded to the diagnostic question, and received knowledge of whether his response was right or wrong he is ready to continue. He presses the "Enter" bar twice, turning off the lights on the response device; the number of the next instructional frame appears in the read-out panel of the response device. The student reads the number of the next frame and manually winds a filmstrip to that frame and repeats the cycle. In Figure II, the student has just completed a response to educational item #126 and pressed his "Enter" bar twice; the computer has selected item #46 for his next viewing, indicating perhaps that the student may now be in a remedial detour.

At various stages during the training period, the student may be required to evaluate his own progress. If he expresses a feeling of confusion, he may be taken to a remedial branch even though his actual performance is above the criterion level for such a branch.

If a student does not perform well in his subject area and needs excessive remedial work, an auxiliary program can be read in from magnetic tape. The student can now proceed on a new series of educational items which could range from a different training approach to a change in media.

Three control buttons, which will not be activated in the initial experimental period, have been added to the response device for actions to be taken by the student. For example, he may want to call the teacher, back up to a previous item, or move forward to a new topic.

The manually-operated viewing device, which presents the instructional items, will hold 35mm filmstrip with a capacity for 2000 frames. The illumination of the screen will be sufficient for reading under daytime ambient-light conditions. Each student's desk is equipped with movable independent-study panels that can be easily brought into place and when lowered become a part of the desk.

The Teacher's Components

The teacher in CLASS will have four sources of information available with which to monitor student learning behavior: (a) a teacher's display console, (b) a soundproofed Flexowriter, (c) a response device similar to the student's unit, and (d) a film viewer for monitoring the educational program. As seen in Figure III, the teacher's display console has ten switchlight buttons, each button corresponding to a single student. Five "Action" buttons are located in the middle of the console; each of these corresponds to a different kind of action to be taken by the teacher. An "Enter" bar allows the teacher to change her action before inserting it into the computer.

When an instructor initiates a period of automated individual instruction (as shown in the classroom on the right in Figure I), she inserts the student assignments from punched cards, presses each student's button on his console, and presses one of the "Action" buttons.

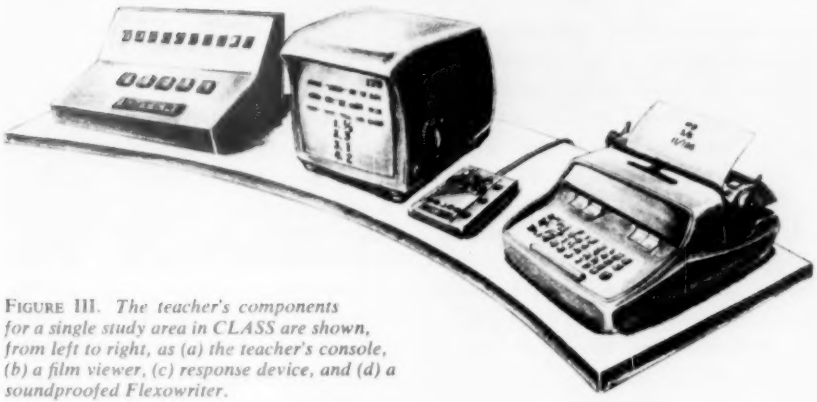

FIGURE III. *The teacher's components for a single study area in CLASS are shown, from left to right, as (a) the teacher's console, (b) a film viewer, (c) response device, and (d) a soundproofed Flexowriter.*

This causes a Student History Tape to be brought into the computer memory indicating where the student is in his lessons, his IQ, and previous grade record. Another magnetic tape (the Subject Matter Tape) will then be read into the computer, presenting the day's lessons to each student.

As the students enter their responses to the instructional items, the computer monitors individual student response behavior and lights the button on the teacher's console of any student who is experiencing difficulty (button #9 in Figure III); that is, any student who makes a pre-specified number or pattern of errors or has an excessive response latency. The teacher responds to this forced display by pressing the student button which has been lighted (which turns out the light), and pressing another "Action" button on her console. In response to this action, the computer causes the soundproofed Flexowriter to print out information on that student's performance and switches the teacher's response device in parallel with the response device of that student. This permits the teacher to monitor the responses of the student. The teacher can continue to monitor the student by observing his responses on the response device since the same lights on both devices are being illuminated. The film viewer of the teacher enables him to read those same items with which the student is apparently encountering some difficulty.

In Figure III, the Flexowriter has printed out the number of the student being monitored (again student #9), the ratio of errors achieved on the current topic to the number of items accomplished by the student on that topic (3/6 in the figure), and the ratio of errors on all topics covered in a given course material to the total number of items completed by the student on that course (11/126). The teacher uses this summary information in conjunction with the performance data she obtained while monitoring the student to decide whether or not to intercede in this student's automated instruction. She may decide for instance to call the student to her desk and quickly point out his source of difficulty. During the training period, or immediately following the

automated tutoring session, the teacher can talk with each of the students she has monitored to clarify certain points. Later in class discussion, she may amplify the topic areas where some of the students appeared to be having difficulty.

The other "Action" switches on the teacher's console are not used, but provide spares which permit the programming of subsequent actions whose desired availability will not be established until the system has been in operation for some time. For example, the teacher may want to call up different kinds of data on individual students or receive automatic print-outs on students fitting certain categories such as most advanced or least advanced. The console also enables the teacher to activate specific student stations when it is desirous to mix the instructional modes. Some students who have been absent because of illness may need more individualized machine tutoring to bring them up to date; in other cases, individual student aptitudes may cause some to take more remedial training while the remainder of the class carries on group discussion.

A Group Mode of Instruction

'It has already been stated that CLASS flexibility provides teachers with the possibility of students working individually at self-paced speeds and on different material, in large groups, or in mixed groups where some are individually tutored and others receive group instruction. In all cases, however, immediate analysis of student performance provides the teacher with prompt diagnosis of student weaknesses since the computer maintains continuous records of performance data. The teacher is thus liberated from most record-keeping, paper-grading tasks no matter what the mode of instruction.

In the group mode of instruction (as it is being conducted in the left classroom area in Figure 1), the TV screen and speaker can serve as a common group output for different kinds of audiovisual presentations. An audiovisual system of remotely controlled slide and film projectors modeled after a system proposed for the University of California at Los Angeles (1) is now under study. This system would enable the teacher to (a) call up films or other displays from the front of the classroom, (b) stop frame the display whenever appropriate for group discussion, (c) repeat short filmstrips or sequences of film when needed for repetitive learning, and (d) select a particular slide at the teacher's command. It would also facilitate scheduling and calling up displays at the moment they're appropriate to the topic being taught.

During the actual class period, the instructor can book a film or series of slides for a specific time. When it is appropriate, she switches on the TV screen, turns to the channel where she sees the first frame of the film or slide she is going to use. It will not be necessary to darken the room. Whenever, during her lecture, the instructor wishes to present her film or slide or stop on a frame, she presses a remote-control button appropriate to the action. A call to the projectionist in the audiovisual center can arrange for additional films or magazines of slides.

If the teacher intersperses her lecture with diagnostic questions which both demand the student's attention and test his understanding, she could receive immediate print-out on her Flexowriter

of certain group, subgroup, or individual student measures indicating the degree of understanding and helping her to redirect her instruction. She can also signal the correct response on the student's response devices by activating the device at her desk.

An automated group-education session, without teacher intervention, can be effected by computer control of the random-access projector now being used by the Automated Education Project at SDC. This projector holds up to 600 slides. Under control of the computer, any one slide can be selected in a few seconds. Group knowledge of results can be achieved simply by giving the correct answer on a slide following each educational item which has a diagnostic question associated. Individual feedback is of course supplied on the student response device. Thus many of the properties usually identified with individual teaching machines (2) such as correction feedback, controlled sequencing, and prior programming can be gained in the group-instructional situation by the use of the computer analysis and control programs.

When a mixed mode of instruction is to be carried out in one classroom—that is, when some students are taught in a group mode and others are working individually—an audio output over individual headsets will be made possible by connectors at each student's desk. One desk will be equipped with a prototype unit which will simultaneously present filmstrips and sound associated with each frame. The sound record is photographically printed on the same film which carries the picture. Eighteen seconds of sound recording can be stored on each frame. With this unit, a single student can be machine-tutored by a teaching machine which has both random-access slide and audio display. This could be an important capability in comparing different sense modalities with students of different aptitudes and for different content areas.

Immediate Plans for CLASS

Concurrent with the construction of the CLASS facility in the Systems Simulation Research Laboratory, the authors will conduct a system analysis of a school system. The analysis will yield a functional description of the sub-systems and the interactions between subsystems. Particular emphasis will be placed upon description of different media that are utilized in teaching and the flow of communication between students and teacher. Answers to questions such as the following will be sought: Who provides what information to whom? What are the system requirements, i.e., reporting practices, grouping and advancement requirements, equipment utilization, etc.? What parts of the total educational system are affected by different actions taken by other parts?

The instruction in a particular educational subject matter, such as English, will be selected for intensive investigation. Special attention will be paid to those aspects of the system where information processing, decision-making, teaching, counseling, and general system performance might be improved by new technological innovations. Some consideration will be given to what functions should be automated and what should be left as currently performed.

Following the system analysis and the completion of CLASS, simulation studies will be conducted to determine the ef-

fects of improvements in system operations. For example, if immediate and accurate information is provided by the computer on the state of academic knowledge of each student, what implication does this hold for future teaching, administration and counseling roles? What would be the implications of individualized automated teaching for curriculum planning, for building construction and teacher preparation?

Other studies can be based on extrapolations from the data of basic research. The computer could be programmed to simulate the responses of students in accordance with a model based on research findings. The responses of teachers, administrators, and counselors to the simulated data could be studied. In addition, exploration of different methods and degrees of automation in the group mode of instruction can be undertaken.

Finally, systems analysis and simulation studies will yield recommendations for the redesign of present school systems and for a prototype of tomorrow's school system.

Blue Sky

Considering the cost of computers, how feasible is a computer-based educational system? The answer would have to be "not very" if a large central computer were required for every school. But it is possible that in the future several schools would be served by a single central computer. For example, the California Department of Education, under the auspices of the NDEA, is currently conducting practical studies in the application of electronic data processing for pupil personnel services at the secondary level. Five schools in the Richmond (California) School District are successfully being serviced by a central computer facility. Similarly, we may contemplate a powerful miniaturized computer of the future processing data obtained from large numbers of students in several schools. It is conceivable that with a moderately large computer, several hundred students could be simultaneously and individually tutored. In the group mode of instruction, when the entire class is receiving the same instructional material, the only limitation on the number of students that can be tutored depends on the nature of the analysis of student performance that has been requested. A concomitant increase in productivity per man-hour of teaching effort would help to offset the cost of the computer. Increased efficiency in the data processing tasks of administrators and counselors would also be a factor to consider. But perhaps the most important consideration is the education in depth that Skinner (14) proposed in his now historical article, "The Science of Learning and the Art of Teaching."

It is easy to speculate on the future automated university or secondary school system. Visualize a computer-based library connected to a national library system where students seated in front of consoles can call up information on the current state of knowledge in any area of the sciences or arts. Consider a student study area where students in their individual study cubicles are instructing themselves with the aid of a machine tutor which is linked via the school-system computer to a national information-retrieval system that is processing written data into courses of study, developing diagnostic questions, and searching for answers to questions

students ask. The same computer that serves the students can be accumulating data and performing analysis for the educator.

Present developments and apparent trends in technology allow us to make some fascinating predictions regarding the future. In the final analysis, however, the future depends upon a long series of studies in basic research, systems research, and experience in actual school situations.

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Audiovisual "Engineers?"

HENRY A. BERN

Dr. Bern, who has been head of the research department at Indiana University's Audiovisual Center for the past three years, was formerly a research psychologist with the U.S. Naval Training Devices Center, Office of Naval Research.

THE LINKING of the fields of education and engineering, in one way or another, is neither recent nor novel. John Dewey did so as early as 1929 in distinguishing between the *science* of bridge-building or education and the *art* of bridge-building or education (6). W. W. Charters raised the question "Is There a Field of Educational Engineering?" in 1945, and provides a basis for ante-dating Dewey in his opening line: "For 20 years, the writer has been playing with an affirmative answer to the question, 'Is there a field of educational engineering?' " (4:31). Subsequently, he did indeed answer it in the affirmative in an article which is titled, quite positively, "The Era of the Educational Engineer" (5). Among other examples up to the present date may be mentioned F. Bobbitt, who spoke of the "educational engineer" using the paradigm of railroad engineering as the framework for his text on curriculum (2); F. L. Whitney, who presented the role of the "educational engineer" as a consultant and cited it in his popular research text (21); and W. K. Estes, who refers to education as "this 'engineering' discipline" (8).

But these are examples essentially of a figurative linking. It would seem, however, that the *Zeitgeist* demands a more literal relationship between education and engineering. R. M. W. Travers expresses this in the following manner:

> It is well known that in industry there has developed a branch of knowledge, referred to as "human engineering," which serves the purpose of adapting machines to the human operator. . . . If a body of knowledge exists about the requirements, abilities and physiological properties of the human operator, machines can be designed that are well within his capacity. The design of equipment to conform to anatomical, physiological, and psychological requirements is an important aspect of industrial design and is now backed by a substantial body of knowledge; *in education there are certain types of related research that must be considered at this point.*
>
> First, there is the problem of designing the regular educational equipment. . . .
>
> Second, there is the problem of the design of educational equipment that is more directly related to the learning process itself. *The field of education has been notoriously deficient in the development of mechanical devices that facilitate learning, but as Sidney Pressey has pointed out on many occasions during the last 20 years, the in-*

dustrial revolution will ultimately come to education and the classroom will then be equipped with mechanisms for the facilitation of learning. (19:56) (italics added)

Assuming that the impact of technology upon education justifies that at least one area of education be specifically concerned with the development of an engineering orientation towards the "facilitation of learning," the question arises as to which of the many branches of education may undertake this. The candidacy of audiovisual communication for this role has been suggested. Thus, according to a report in *Audiovisual Instruction* the audiovisual director has been granted public recognition as possessing "greater proficiency in what might be called 'educational engineering'" (7). And Finn claims that "we, the audiovisual specialists are, of all educational personnel, the closest to technology, now . . ." and that the audiovisual specialist is "really the only technologist of the teaching profession . . ." (13:22).

Such claims, however, need to be supported by reasonable arguments and evidence concerning the qualifications of the audiovisual field for this role. This article will endeavor to sketch some of the reasoning and evidence which can be brought to bear on this claim.

The argument will be made that the field of audiovisual communication is indeed a most fitting candidate because of (a) the suitability of its theoretical concepts, (b) the orientation of its leadership to engineering influences, and (c) the existence of a considerable body of research which has already been developed within an "engineering" framework. The purpose of the argument is not to "prove" but to "present" the case for members of the profession to refine, elaborate, discuss, and evaluate.

Suitability of theoretical concepts. In the first issue of the AV COMMUNICATION REVIEW, the question of the adequacy of existing theoretical frameworks for audiovisual communication was raised (12). Subsequently, although many articles have been concerned with theory indirectly and some (for example, Gibson's "Theory of Pictorial Perception") discuss an aspect of communication, the major articles that attempted to provide a theory of communication were those by Westley and MacLean in 1955 (20) and by Gerbner in 1956 (15). An "analysis" of these theories reveals a common framework which is suitable for an engineering orientation.

What is the fundamental "nature" of the Westley and MacLean model? No direct answer is provided in the article by the authors themselves. Examination of the language used to describe the model, however, reveals as the key terms such words as "message," "transmission of messages and codes," "encoding," "decoding," and above all, "feedback." Where do these concepts originate? Clearly, they do so in information theory and cybernetics.

What is the fundamental "nature" of the Gerbner model? Gerbner *does* point to the origins of his model but his referents are ambiguous. He says "the model incorporates some features of previous models (see bibliography) and adds some new features of its own" (15: 171). Unfortunately the 21-item bibliography contains such a heterogeneity of references that it is difficult to discern which refer to previous models. Both verbal and pictorial language for key concepts, however, enables us to "place" the model—and we find that it is likewise related to information theory and cybernetics. For example, there is a sec-

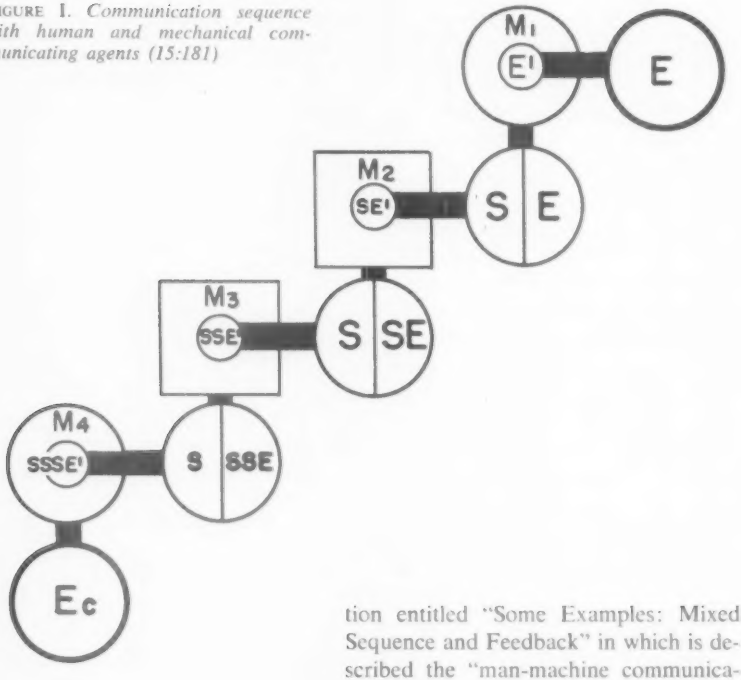

FIGURE I. *Communication sequence with human and mechanical communicating agents (15:181)*

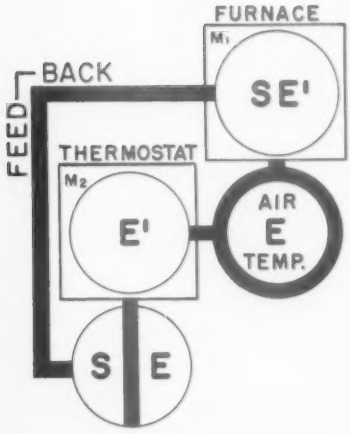

FIGURE II. *Automatic control: closed communication chain with feedback (15:183)*

tion entitled "Some Examples: Mixed Sequence and Feedback" in which is described the "man-machine communication system" illustrated in his Figure IV (Figure I, above).

The cybernetic concern with "automatic controls" is disclosed in reference to illustration of his Figure V (Figure II, left).

The information concern is clearly indicated in the parallel comparison with the Shannon model in his Figure IX (Figure III, next page).

In other words, it is suggested that the novel aspects of the communication models offered by MacLean and Westley and Gerbner both rest upon notions which can be credited primarily to Shannon (18) and Wiener (22). Since both Shannon and Wiener are primarily mathematicians, what has this to do with the *engineering* orientation? It is frequently overlooked that the origin of the information theory as developed by Shannon

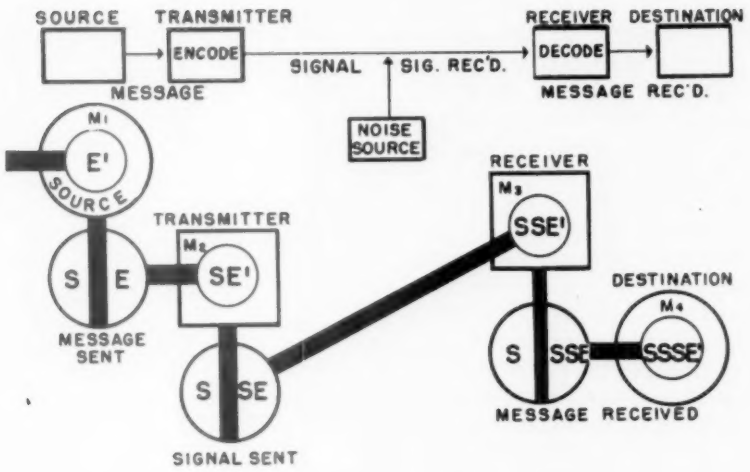

FIGURE III. *Shannon's diagram of a general communication system (top) compared with the progress of a signal in the same system as illustrated on the graphic model (15:191)*

arose in the problem of the *communication engineer* and that cybernetics as developed by Wiener arose in the problems of the *control engineer*. In the fascinating introduction to his text, Dr. Wiener indicates clearly that it is the fundamental paradigm of the engineer's servo-mechanism (and within that paradigm, the critical element of feedback) which characterizes the new point of view which links *man and machine*.

To summarize this section, such theories as have been advanced recently for audiovisual communication have an engineering origin, whether the authors realize it or not. The audiovisual specialist can be considered close to technology through the theoretical structures in his field.

Orientation of leadership to engineering influences. Although it would be interesting to make a more exhaustive evaluation of the relationship of the leadership of audiovisual communication to engineering, the manifest content of readily available public evidence for such respected figures as Finn, Allen, Hoban, and Carpenter are deemed sufficient for our argument.

It has been a rewarding experience to watch one of the field's foremost thinkers move from an assessment of the needs for the professionalizing of the audiovisual field (12) to a search for historical factors upon which to predict its future (11) to a consideration of the potentialities for good and evil of the historical factor of the "second industrial revolution" (9, 10) and finally, to an unequivocal position on the side of technology. The position is clearly stated in his *redefinition of the goal of the professional AV person—"to become a specialist in learning technology"* (13: 22).

In the case of Allen, we have less extensive evidence. We can however point to his direct professional relationship

with engineering. The old masthead of AV COMMUNICATION REVIEW has for years shown Allen to be associated with engineering organizations — first with RAND Corporation and subsequently with its offspring, System Development Corporation. According to a descriptive brochure, System Development Corporation is primarily a *research engineering organization* whose unique specialty is the *control system*—"a complex of machines and human beings formed to collect, process, transmit, and display data concerning events taking place at widely separated locations, to take action to control the events and to provide the managers of an organization with the facts they need for decisions affecting its total mission."

As a point of departure for our subsequent references to both Hoban and Carpenter, it might be noted that one of the four major professional groups in System Development Corporation is the Human Factor directorate—a group defined by its concern with the human elements of *man-machine control systems*. In their contributions at the Stanford Symposium (17)* both Hoban and Carpenter reveal their "sensitivity" to the man-machine systems engineering approach. Thus Carpenter suggests a "systems approach" to teaching and learning:

> The general requirements are known for employing this higher order "man-machine systems approach" to the solutions of complex operational problems like those of education and including the media sub-systems. They are the following:
>
> (a) Achievement or performance goals are defined. (b) These goals are then translated into sub-systems of general and specific functions. (c) The means of executing these functions are specified, and components of the systems are defined to include human capabilities, machines, materials, and their interaction in the system. (d) Distinctions are made between those functions which can best be performed by persons with known competencies and those which can best be performed by instrumentation and materials with known characteristics. (e) Schedules and sequences of events are so planned that all components of the system, sub-systems, and functions operate as required and in an orderly manner. The designed system, when tested and retested, may have its components changed or re-ordered to maximize the performance of the system as a whole in accomplishing projected goals or objectives.
>
> A systems design for an educational enterprise would provide: A conceptual framework for planning, orderly consideration of functions and resources including personnel and technical facilities such as television, the kinds and amount of resources needed, and a phased and ordered sequence of events leading to the accomplishment of specified and operationally defined achievements. A systems approach should provide a way of checking on the relation of performances of all components to factors of economy and should reveal any inadequacies of the several components, including the faults of timing and consequently of the entire system. (17:75)

Similarly, in discussing new concepts for future research, Hoban describes and supports the "systems concept" as follows:

> While we have long spoken of school *systems*, university *systems*, and educational *systems*, we have not taken the system concept sufficiently into account in research on films or other communications media in education.
>
> . . .
>
> A system can be defined as an arrangement of components with a common purpose. The importance of the system concept is in the notion of (a) components in a system; (b) the integration of these components; and (c) the increase in system efficiency achievable by trading improvement of one component against improvement of another or others. . . .
>
> . . .
>
> *If we are to cope adequately in educational media research and in the imple-*

* In view of the limited current availability of this report, extensive quotations are given.

mentation of research findings, use of the system concept is intellectually and practically inescapable. (17:109) (italics added)

Subsequently, in discussing "Theory of Information and Communication" Hoban insists upon and demonstrates the technical vocabulary of communication engineering:

> It is reasonably safe to infer that the development of communication theory is an outgrowth or concomitant of the development of information theory. Certainly, all of us are familiar with Shannon and Weaver's discussion of communication theory, which is still valid. However, their discussion deals primarily with the structure of communication and only by implication with its dynamics. It does not go into the characteristics of information controllable by the source or the receiver, or both.
>
> *Rate, reliability, redundance, ambiguity, time-phasing, quantity,* and *discriminability of information* are primarily source-controlled. *Exposure, selectivity, capacity, receptivity,* and *durability of information* are primarily receiver-controlled. *Feedback* is system-controlled. *Matching* the *source-controlled* and *receiver-controlled* operations is the art of communication. It is in this matching that the characteristics of the audience (the receiver) play such an important role. It is in the trade-off between production techniques and teaching techniques that difficult system decisions are encountered, since many of the characteristics of information, assigned above to source or receiver, are to some extent controllable at either pole of the communication transaction, and frequently involve or require attention and activity at both poles.
>
> *The least that can be expected from the use of information and communication theory in media research is an improved technical vocabulary that permits the researcher to deal with relevant variables.* As previously indicated, *an adequate technical vocabulary is not available elsewhere.* (17: 110) (italics added)

Audiovisual research within an engineering framework. It may perhaps come as a surprise that "Instructional Film Research 1918-1950," a study which Allen says "serves as an irreplaceable benchmark from which any subsequent review [of audiovisual research] must take its direction and [which] should be in the library of every serious student of AV communication" (1:116) was executed under the supervision of a "Project Engineer" in a Human Engineering group. In the files of the U. S. Naval Training Devices Center,* this "benchmark" retains its humble designation "SDC. Human Engineering Project 20-E-4."

Note the initials "SDC" (Special Devices Center) and examine the other entries in the bibliography of audiovisual communication research presented by Allen. You will find from 15 to 20 percent of the entries so marked. Some of these will even include the term Human Engineering Report (as in entries 11, 39, 53, etc.). Actually, *most* of these items, like the "benchmark" study, were done under the supervision of Human Engineering "project engineers," as an examination of the title page of each report will readily disclose. The above estimate of 20 percent would undoubtedly be far greater (a) if a distinction were made between "experimental" studies and other types of entries such as books, general articles, etc. (for example, entries 26, 27, 45, 49, 85, 86, etc.) and (b) if items were included for other agencies which had human engineering or human factors personnel conducting or supervising research projects, for instance, item 276 in the bibliography:

> 276. Swanson, Robert A., and others. "Two Studies in Evaluation of Maintenance Training Devices." *Air Force Human Engineering, Personnel, and Training Research,* (Edited by Glen Finch and Frank Cameron.) ARDC Technical Report 56-8. Air Research and Development Command, 1956. p. 267-75 (1:136).

In other words, a considerable por-

* Formerly U. S. Navy Special Devices Center (whence SDC).

tion of the "best" audiovisual research can officially bear the label of "human engineering" research! We can thus say that the audiovisual specialist is "close to technology" as a result of the significant research in his area.

Human engineering and instructional communication systems engineering. The terms "human factors," "human engineering," "man-machine relationships" have appeared a number of times in our discussion above. In fact, these terms, as used by Travers and Carpenter and as related to the organizations with which Allen and Hoban have been associated, are part of the "evidence" used to support the basic argument of this paper.

If we accept "human engineering" as the most inclusive of these terms (16: vii) we can say that it appears to be the chief agency through which the field of audiovisual research has been changing under the impact of the technological revolution which Finn describes so well. For audiovisual persons who were heretofore not "aware" of the extent of this relationship (and this is perhaps most of us!), it may be therefore well to spend a few minutes before concluding this paper to indicate briefly some further relations and distinctions between audiovisual communication and human engineering.

To start with the "humorous," it might be noted that, like the field of audiovisual communication, the field of human engineering is plagued with unhappiness about its name. Just as audiovisual communication people have tried to find more definitive names for their field, so practitioners of human engineering alternately use such terms as biomechanics, bio-technology, experimental psychology, engineering psychology, human factors, etc., in search for a happy term.

Considering more serious relationships, we might compare the basic concerns and goals of the two fields. Chapanis defines human engineering as "that branch of modern technology which deals with ways of designing machines, operations, and work environments so that they match human capacities and limitations" (3:vii). McCormick defines it somewhat more broadly: "Human engineering," he writes, "can be thought of as the adaptation of human tasks and working environments to the sensory, perceptual, mental, physical, and other attributes of people. This attribute of human use applies to such functions as the design of equipment, instruments, man-machines systems and consumer products, and to the development of optimum work methods and work environments" (16:vii). If we look closely, it may be seen that some of the concerns of audiovisual communications can be subsumed under those of human engineering! Has not audiovisual communication *ever* been concerned with devices of one kind or another (machines if you please), to modify operation and environments in order to "match human capacities and limitations?" Consider next, McCormick's statement that "in broad terms the goals of human engineering are those of human economy, or efficiency in work activities . . ." Have not the broad goals of audiovisual communication *ever* included basic economy and efficiency in school activities?

What then is the distinction? Apart from obvious and complex differences that may be discussed on the basis of the *broad* distinctions between human engineering and audiovisual communication, it is suggested that a pragmatic distinction can be made on the basis of the occasion and the type in which the

similar concerns of the two fields crystallized. Audiovisual communication crystallized within the field of public education about the problems of learning made uneconomical and inefficient because of the *verbal and abstract complexity* of the material to be learned. Human engineering, essentially a World War II product, crystallized within the field of military training about the problems of learning a *complex equipment* environment. These are of course oversimplifications. Both fields of endeavor, for example, are developing and are extending their interests to business, industry, etc.

A convenient way of distinguishing the engineering aspect of audiovisual communication at least by name, however, seems desirable. Some time ago Finn suggested that the term "communication engineering" be applied to this aspect of audiovisual communications (14:87). This hardly seems sufficient. Even within the field of engineering proper, it has been necessary to make further distinctions such as "electrical" or "electronic," or "telecommunications," etc. In the audiovisual field, combinations of modifiers such as "training," "education," or "instruction," and "communication," or "communication-systems" readily come to mind. In the Audiovisual Center at Indiana University, the term "instructional communication-systems engineering" has been used. Activities in this area have been defined as those in "the emerging discipline of communications which are concerned with the development and application of communications theory to 'digital' (word, number) and 'analogical' (picture, model) information and the techniques of presenting and programming such information to structured, immediate feedback communication - systems (pupil - machine; teacher - pupil; trainer - trainee; etc.)" Perhaps the simplest term, however, would be "audiovisual engineering"!

Summary. This article has presented some of the "qualifications" of audiovisual communication to absorb and transmit to the field of education as a whole the impact of the technological revolution of our day. To support the claim of closeness of relationship between audiovisual communication and technology, evidence was offered in relation to (a) suitability of theoretical concepts, (b) orientation of leadership, and (c) research rooted in engineering frameworks. Finally, the hypothesis was offered that the underlying basis for these qualifications is a concern with information and communication theory which audiovisual communication has "absorbed," principally through contact with the field of Human Engineering.

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Does Presentation Method Influence Film Learning?

A report in brief by ***Philip C. Minter, Fritz A. Albert, and Richard D. Powers***

Philip Minter received his doctorate from the University of Wisconsin last year before returning to his native Australia where he is currently considering positions in the television and public relations fields. Both of the other authors are staff members in the University's department of agricultural journalism, Mr. Albert as head of the information film program and Mr. Powers as instructor and researcher.

FROM TIME TO TIME proposals crop up for increasing the effectiveness of instructional films through variation in methods of presentation. Among these are the suggestion that rest pauses be added to the film showing and a rather common proposal that during film breaks, students practice the task being taught or participate in discussion. A less overt form of participation has also been proposed—an "invitation to thought" about the film subject in the form of questions or statements inserted into the film.

Allen [1] has adequately reviewed research on all but the first of these proposals. As his review indicated, there has been much interest in the effects of these variations in presentation techniques. However, no study unattended by the confounding factors of the film subject matter, different audiences, different criteria of effectiveness, and different research situations has been made to provide valid comparisons of each of the three variations with each other and with straight presentation (continuous showing).

The purpose of the project reported here was to provide such comparisons for short films produced to teach factual information necessary for accomplishing certain procedures in clothing construction.

Secondary aims were to investigate whether an audience's intelligence level and perceived interest in the film subject had an influence on the relative

[1] Allen, William H. "Research on Film Use: Student Participation." *AV Communication Review* 5: 423-50; Spring 1957.

effectiveness of the various methods of presentation.

Methods

The methods of presentation tested were:

1. Continuous showing of the film without comment or questions. This was in effect the "control" in the experiment, since the other methods were compared against it.

2. Breaking the film into several parts to give the audience a rest pause between each part. The purpose was to enable viewers to rest their eyes and relax momentarily on the assumption that they would then be more receptive when the showing resumed.

3. Incorporation of an opportunity for a kind of "passive participation" in the form of written questions and statements spliced into the film. These were intended to prompt the audience to think about that part of the film they had just seen. The questions and statements were typewritten and photographed without accompanying commentary in a manner which could be used in any film. It was thought that if this method should be found superior in its contribution to learning, many existing films easily could be so adapted.

4. Stopping the projector to permit semi-overt participation between sections of the film. Participation took the form of the audience asking questions of the instructor, the instructor questioning the audience and the audience writing notes dictated by the instructor.

Four eight- to ten-minute films dealing with various aspects of clothing construction were produced for this study. A conscious effort was made to keep the films comparable in difficulty. As stated before, the purpose of the films was to teach factual information necessary to perform the procedures. No attempt was made to teach basic skills such as the use of a sewing machine or an iron for pressing, both necessary to performance of the task. Rather, learning was tested by administering an objective test on the factual information in the film.

Subjects were 185 girls in seventh grade sewing classes in six Madison schools. They were assigned, in eight intact class groups, to the various experimental treatments and each group saw four films at intervals of about one week. An objective test immediately followed each film. A questionnaire prior to the experiment assessed each student's interest in sewing. The *California Mental Maturity Index* used by the Madison school system was the score employed to estimate level of IQ. These scores ranged from 77 to 157, and the division into "high" and "low" intelligence was made at the median for each class.

The study was designed to make use of precision methods of statistical analysis. The use of a Greco-Latin square permitted the examination of the variable under study (methods of presenting the film) while balancing out influences of the order of showing, differences between audiences, and differences between films used. The design also allowed investigation of the effects of interest and IQ and gave an indication of the error produced by uncontrolled variables.

The Greco-Latin square is particularly useful in experiments where the subjects cannot undergo repeated exposure to the same treatment or where it is impossible to equate groups in all

TABLE 1 — DESIGN OF THE STUDY

Type of Presentation	*Subject of Film*				
	Stay-Stitching Plus	*Buttonholes*	*Attaching A Zipper*	*Attaching A Skirtband*	
Straight	1st film shown to audience A (cell 1)	2nd film shown to audience B (cell 2)	3rd film shown to audience C (cell 3)	4th film shown to audience D (cell 4)	Average for straight presentation
With Rest Breaks	3rd film shown to audience B (cell 5)	4th film shown to audience A (cell 6)	1st film shown to audience D (cell 7)	2nd film shown to audience C (cell 8)	Average for presentation with breaks
With Questions Inserted	4th film shown to audience C (cell 9)	3rd film shown to audience D (cell 10)	2nd film shown to audience A (cell 11)	1st film shown to audience B (cell 12)	Average for presentation with questions
With Discussion Breaks	2nd film shown to audience D (cell 13)	1st film shown to audience C (cell 14)	4th film shown to audience B (cell 15)	3rd film shown to audience A (cell 16)	Average for presentation with discussion
	Average for film on stay-stitching	Average for film on buttonholes	Average for film on zippers	Average for film on skirtband	

To get average scores for the separate audiences, cell scores were averaged as follows:

Audience A—cells 1, 6, 11, 16
Audience B—cells 2, 5, 12, 15
Audience C—cells 3, 8, 9, 14
Audience D—cells 4, 7, 10, 13

To get scores for various orders of presentation, cell scores were averaged as follows:

First film—cells 1, 7, 12, 14
Second film—cells 2, 8, 11, 13
Third film—cells 3, 5, 10, 16
Fourth film—cells 4, 6, 9, 15

pertinent respects. Both these factors are generally present in film studies. For example, if one group of subjects sees a film presented in a certain way, the same group cannot be tested on the same film shown another way. Also, even though two audiences are equated on intelligence or other measurable factors, they may differ in important respects such as film viewing sophistication.

In this experiment, the Greco-Latin square gave the plan of testing shown in Table 1.

Note how the design balances out the effects of one variable upon another. For instance, when we wish to compare results of the straight presentation with the results obtained by inserting rest breaks into the film showing, we combine test answers from four different audiences to get the two numbers we want to compare. So if one audience made generally better scores than another on all tests, this would not invalidate our comparison between the two methods of presentation. If the order of presentation made a difference in test scores, this in turn would not affect the comparison of presentations because each audience saw the presentations in a different sequence, and in the end, the "order effect" balances out. Likewise, if the information presented by a particular film made a difference in test scores, this would balance out because each film was subjected to each of the changes in method of presentation. In operation, the design allowed us to study the effect of our main variable and method of presentation while controlling three other variables—the subject of the films, the order of presentation, and the differences between audiences.

Two separate experiments were conducted. The error term indicated the second experiment to be more precise. Also, the experimenter's increased familiarity in leading the discussion involved in one method of presentation suggests that results of the second test be considered the more reliable of the two.

Results

Table 2 summarizes the results of the analysis of variance and shows the mean scores for the two tests.

For the test group as a whole, most learning took place when the groups participated by note-taking and class discussion during a break in the showing. But this benefit accrued to students who were not particularly interested in sewing, and did not appear in test scores made by those already interested in the subject. When the scores were analyzed separately for students of "high" and "low" intelligence, only students of higher intelligence benefited from the participation; there was no significant increase in scores of students in the lower intelligence group.

Note that the presentation technique of class participation and note-taking proved superior wherever the analysis of variance indicated any difference among the methods, except for the one case where it ranked about the same as the method with inserted questions. It should also be noted that the increase in scores was always less than two points on a scale of 25. Though these results are statistically significant, the practical importance of such differences is open to question.

The use of rest breaks had no apparent effect on scores in the test. However, it should be pointed out that these films were short, and it is not possible

TABLE 2—MEAN SCORES FOR METHODS OF PRESENTATION
(Perfect score is 25.00)

	test	*Means arranged in descending order* *			
For entire audience	1	(3) 16.22	(4) 15.46	(1) 15.44	(2) 15.38
	2	(4) 18.88**	(1) 17.26	(3) 17.12	(2) 17.12
For "interested" group	1	(3) 16.56	(2) 16.53	(1) 16.50	(4) 15.72
	2	(4) 19.00	(3) 18.00	(1) 17.95	(2) 17.38
For "uninterested" group	1	(3) 15.89	(4) 15.19	(1) 14.39	(2) 14.22
	2	(4) 18.75**	(2) 16.95	(1) 16.57	(3) 16.23
For "high IQ" group	1	(4) 17.58	(3) 17.42	(2) 16.92	(1) 16.75
	2	(4) 19.90**	(2) 18.10	(3) 18.03	(1) 17.90
For "low IQ" group	1	(3) 15.53	(1) 14.36	(2) 14.03	(4) 13.72
	2	(4) 17.50	(1) 16.88	(3) 16.30	(2) 16.15

* Numbers in parentheses indicate method of presentation: (1) continuous showing, (2) with rest breaks, (3) with questions inserted, (4) with discussion breaks.

** Significantly different at the 5 percent level of confidence when subjected to Duncan's Multiple Range Test.

to say what the effect might be with longer, more tiring films.

Though the films with inserted questions were as effective as those using the participation method in one analysis (Table 2), these experiments did not show it to be a consistently superior method. In this situation, at least, insertion of questions and statements would not have been worth the expense involved.

The most consistent result of this test was the superiority of *Stay-Stitching Plus*, the one film on which students made the highest score in all cases. The other three films did not differ significantly from one another. The consistent superiority of this film would suggest that on short films, at least, the subject matter and/or skill of production are much more important to learning than are changes which can be made in methods of presentation.

Analysis of the final "control" variable—order of showing—indicated that order did make some difference, but there was no great consistency in the results. Where order was significant, the third film shown tended to be better than the first, second, or fourth. Nothing consequential was shown by the analysis of differences between classes.

Tables showing the effects of order, films, and classes are not presented in this paper because these concerns were secondary to the main purpose of the research. The design, as stated confounds the effects of these variables among the methods of showing, so those effects balance out.

Summary

1. Active participation of the audience in the form of class discussion and note-taking promoted significantly more learning from the films than did any of the three other methods of presentation tested in this study.

2. The gain from such participation occurred among two groups: the initially uninterested and the higher intelligence group. None of the methods of presentation used in this study showed any significant advantage over the others for

the students of lower intelligence or for those who evidenced a strong prior interest in the subjects of these films.

3. The classes tended to learn more from the third film viewed than from the first, second, or fourth.

4. For short films (eight to ten minutes) it appears that the subject of a film and/or the skill with which it is produced are a more significant and consistent influence on its efficiency in teaching factual information than any of the four methods of presentation tested in this study.

MIDWEST AIRBORNE TELEVISION AND THE TECHNOLOGY OF EDUCATION

*Robert W. Kilbourn**

INVENTION, IN A SENSE, may be termed "the mother of necessity." This reversal of the well-worn phrase points to our inability to be ready for change. Once an invention is recognized, we see a need for many more inventions that could not have been thought of before the initial innovation. For example, we are still hard at work to achieve the social and technical changes necessary to promote and control the use of the automobile more than 50 years after its development. We are involved in the very rapid development of a computer-controlled technology of industrial production; the necessities posed are present in the hungry lines of men at welfare and employment offices.

The Midwest Program on Airborne Television Instruction (MPATI) may be considered as a case study in the application of technology to educational processes. The MPATI proposals, in effect, are inventions of human-machine systems designed to deal with certain realms of educational problems. The disturbing effects of the MPATI program on the profession have been experienced before and will be experienced again whenever innovations are introduced.

The plan is to telecast year-long course sequences for use at the elementary, secondary, and college levels. The MPATI stations will fly in a DC6AB aircraft at an altitude of 23,000 feet near Montpelier, Indiana. The ultra-high-frequency channels 72 and 76 will be used to telecast to a six-state area including parts of Illinois, Indiana, Kentucky, Michigan, Ohio, and Wisconsin. Within this estimated range of over 150 miles, there is a potential audience of five million students in 13,000 schools.

In this brief article I do not propose to review the many details of the MPATI plan of operation. Detailed evaluation of technical quality and professional competence in the program must be delayed until a full schedule of telecasts are presented. Difficulties in the technical sphere forced postponement of even the sample program series until late in the spring of 1961. It is appropriate, however, to examine some of the issues involved in MPATI programming, certain items dealing with the economics of the Program, and ideas that relate to the

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development of technological systems for education.

When the full MPATI schedule of telecasts begins in September 1961, it will include 28 courses on a 40-hour per week schedule. The elementary school offerings will total 16½ hours; the secondary, 16½ hours; and the college courses, 7 hours. Most of these courses will be presented within the framework of a teacher-on-screen lecture and demonstration.

This lecture-demonstration format provides us with the first question concerning the relationship of the profession to the Airborne Program. What role is expected of the classroom teacher who uses the MPATI programs? Clearly, he must follow the lead of the television teacher if the programs are to achieve the effect intended. In one sense, the classroom teacher is relieved of some of the burdens of transmitting information. In another, he may feel compelled to go beyond the television teacher with more complex presentations of information. The problems of individual differences in students, discipline, and the social structure of the learning environment still remain for the classroom teacher.

To assert that the first-generation MPATI programs do not adequately encourage significant learning by individual students merely turns the problem back to the profession for reconsideration. With honesty, we may say that the MPATI programs serve as mirrors which magnify our professional blemishes. Observation of current classroom practices would show a high frequency of just the lecture-demonstration form of presentation which MPATI plans to transmit. This leads us back to a concern for the adequacy of our prevailing practice.

Neither MPATI programming nor conventional classroom practice seem to be supported by an adequate conception of the role of individual learners. We seldom recognize that *individuals select* from the experience they encounter just what they will learn. The equating of "what is presented" with "what is learned" is not an assumption unique to educational television. We have too often viewed students as "note-takers" and information-feedback mechanisms. We evaluate our conventional programs of education with subject-matter achievement tests. We should not be surprised that these tests form the primary standard for evaluation of television teaching.

Conventional teaching proceeds without adequate concern for readiness and variability of individual experience, and MPATI programming has a similar weakness. We seem to be deep in the mire of dealing with individual learning framed as a problem of controlling masses of individuals. This dilemma follows logically from the attempted social revolution of education for everyone. We have not, however, achieved the concomitant revolution within educational institutions that would build schools for everyone.

Education for everyone may not be realized until we design the technological tools that will help us produce it. Once again, let us think of the history of technology in industry. The artisans of the pre-industrial period could not produce the goods needed to expand the well-being of growing populations. Their efforts were multiplied by the use of machines to do a portion of men's work. The artisans opposed the development

of industry and all but disappeared during a short span of history. Today, we have a rapidly developing technology of information-handling that may be used to multiply the efforts of the artisans who have been our teachers.

With some fear and trembling we think of the ways in which technology of information-handling has already bypassed the schools in an effort to achieve direct contact with individuals. Commercial television in recent years has continued the high art of documentary programming to such an extent that these programs are often a better source of information than any but the most scholarly realms within schools. Technological effects are also evident when children come to kindergarten after several years of television viewing.

For purposes of comparison, it may be worthwhile to examine the necessities posed by the printed media. With respect to the early years of schooling, there is not much evidence that educators have faced the opportunities and necessities raised by the development of printing. Experiences of children with printed materials are still limited by lack of library facilities in elementary schools. We have attempted to *control* development of reading and learning through monopolistic uses of textbooks. In the public sphere, we have not matched the imaginative approach of the Carnegie-assisted libraries of many years ago. We need another great effort to place library materials close to where people live, particularly in the sprawling suburban areas developed during recent years. The neighborhood drugstore or supermarket, however, may bypass the libraries through wider distribution of quality paperback books.

It is important that the profession ask the Midwest Airborne Program to help it move toward developing systems of educational technology. The profession will get no help if the MPATI program of evaluation only compares the transmission efficiencies of conventional teaching and MPATI teaching. The lecture-demonstration method is probably inadequate whether done on television or by teachers in the classroom. Equivalence of television lecture and classroom lecture does not prove that either has significant effect on individual learning. We may reason that zero equals zero without regard for the medium.

The lecture-demonstration format usually transmits ready-made generalizations to students. The effectiveness of the format is measured by the accuracy of students in feeding back on achievement tests the answers they have been given previously. Students are rewarded for behaving like parrots. Can we not develop a framework which will give students the raw material to encourage individual discovery and development of generalizations?

It seems that MPATI programming mirrors one of the least effective of our present practices rather than the best we can achieve. Does this mean that our new technology of education will mass produce the commonplace and mediocre? Will the profession fumble the opportunity to produce excellence?

One of the real dangers of MPATI programming and the programming of all educational television stations may be a premature hardening of conceptions of the medium. We have seen this rigidity in the conception of the instructional film as "textbook with sound and pictures." This rigidity appears also in textbooks which have most of the life and controversy filtered out.

There are those who maintain that television for education has limitations of both an economic and technical nature. We probably are not close to either of these limitations in our present operations. We are bound only by the decisions of men who have conceived the limitations rather than the potentials of the medium. When MPATI dared to expand the technical limits to that of a 23,000-foot tower, where were the men who dared to expand the nature of programming to the regional rather than the local level? Where were the men who recognized that "stored" and reusable television was different from the ephemeral forms of live television? Where are the men who would dare to suggest a national network of educational television? Perhaps we should be much more daring and suggest several competing national networks for education.

Consider the possibilities if we thought of educational television as a medium to communicate directly with students in their homes rather than in school. Could the profession create programs of learning that would compete successfully for the attention of the noncaptive audience of students in the home? Could we face the prospect that educational television may not be a classroom medium except in an economy of scarcity, or in the early stages of its development?

There seem to be several issues relating both to the economics of the television medium and the professional quality of its programs that have not been considered with enough care. Proportionately, too much money in educational television is spent for establishment and maintenance of the technical facility, too little for development of programming. This is an old story in audiovisual education. Think of the motion picture projectors that gathered dust in school closets because budgets did not allow purchase or rental of films to program the machine.

In television, tremendous sums have been spent for videotape facilities to record programs that are not significant improvements over live programming. The "stored" or published program should have a quality far beyond the ephemeral happenings that seem sufficient for live programming. We still have with us an assumption that the *medium* is "magic" by itself without regard for the quality of program it transmits. The medium itself is nothing. The qualities of potential learning are determined by the decisions of men—both technical and professional.

According to financial estimates released by the Midwest Airborne Program, the total cost of all aspects of its operation amount to $7,750,000. This amount will cover only capital costs plus actual telecasting for the test period during the spring and summer of 1961 and operation during the school year 1961-62. If telecasting is to continue through 1962-63, an additional $2,095,000 will be required. Statements from MPATI do not allow for analysis of just what proportion of almost $10,000,000 in total cost have any relationship to the quality of programs developed. If the profession is to make judgment on both an economic and a qualitative basis, we should have more detailed cost figures from MPATI.

When final economic evaluation is made, it should not neglect another item—the cost of equipping schools to receive the programs. The receivers alone for the 13,000 schools in the coverage area would cost roughly $2,500,-

000 if only one receiver were placed in each school. In the large metropolitan areas on the fringe—Chicago, Detroit, Cleveland, and Louisville—the costs of special antennas and booster amplifiers must be added so that average will rise to around $500 per set in multiple-set installations. If sufficient receivers are provided to give five million students the full advantage of MPATI programming, it seems certain that another $10,000,000 must be included in the final cost analysis.

If the Airborne Program is promoted on the basis of economy, we must have not only a complete analysis of programming and reception costs, but also an effective measure of quality of learning in relation to the economy of various other means of information-handling that might be substituted. The demand for quality measurement must be met by an almost unprecedented professional effort. The measurement of quality of learning is essential for development of a much needed theory of educational productivity. We have invented only some of the measuring techniques needed to understand the teacher's functions in a productivity theory. We have almost nothing to guide us in determining the individual learner's functions.

In this discussion, I have attempted to raise issues relating to quality of experience for individual learners. Conventional frameworks of teaching and learning seem inadequate in their conception to allow a firm basis for building the human-machine systems which are among the necessities raised by recent technology. The profession has not developed concise programs for evaluating the human elements in the learning process. We have proceeded through lack of decision almost to the point that we have a "party line" declaring that all kinds of learning must take place through immediate interaction of learner and teacher. We have some knowledge about what students can learn independently with proper materials; but we fail to show that we value this knowledge when we design educational programs.

The Midwest Airborne Program is incomplete in its conception because it proposes to program one of the most routine and least promising of our conventional methodologies. We can rely on no "magic" in the medium of television to make our habitual, human efforts creative. Even if the economic evaluation of MPATI shows a great saving in money and human effort, we ought not to feel satisfied unless the quality of the learning encouraged is worthwhile.

JOINT COMMITTEE PREPARES INTERIM GUIDELINES

CONSIDERABLE CONCERN has been expressed over the problem of adequate dissemination of information for the guidance of prospective users and purchasers of auto-instructional programs and devices. This problem becomes intensified as the number and variety of devices and programs offered for sale to educators continues to steadily increase, particularly in view of wide variations in the quality of programs and a tendency to market materials that have not in all cases been adequately tested.

Committees of three of the national professional associations directly concerned have been appointed to study the problem and to make joint recommendations for action. These organizations are the American Educational Research Association, the American Psychological Association, and the Department of Audiovisual Instruction of the National Education Association. Two joint meetings of the committees on auto-instructional methods and devices appointed by these three professional associations have been held during 1961—in Chicago in February, and in Miami in April. These meetings have confirmed the belief that there is both an immediate need for interim guidance and a longer-range need for more complete technical guidance, including a means whereby technical recommendations could be progressively updated in the light of the developing state of the art.

Work has been initiated on the preparation of a manual of technical recommendations to guide the development and assessment of auto-instructional programs and devices. Such a manual would be similar in purpose to the widely-used manual on tests and diagnostic techniques which was prepared several years ago by a joint committee of the APA and AERA (and which is currently being revised). Meanwhile, as a first piece of interim guidance the committees have jointly drafted a brief statement which appears below and which, with the assistance of the parent organizations, will be disseminated widely in the near future in educational journals.

This statement was prepared by the following committee membership:

American Educational Research Association: Arthur A. Lumsdaine (Chairman), University of California, Los Angeles; Robert Glaser, University of Pittsburgh; Evan R. Keislar, University of California, Los Angeles; Harry F. Silberman, System Development Corporation, Santa Monica, California.

American Psychological Association: Richard S. Crutchfield, University of

California, Berkeley; James G. Holland, Harvard University; Lawrence M. Stolurow, University of Illinois.

Department of Audiovisual Instruction, NEA: Jack V. Edling, Oregon College of Education and U. S. Office of Education; Edward B. Fry, Loyola University, Los Angeles; Wesley C. Meierhenry, University of Nebraska.

* * *

A JOINT STATEMENT ON SELF-INSTRUCTIONAL MATERIALS AND DEVICES BY COMMITTEES OF THE AMERICAN EDUCATIONAL RESEARCH ASSOCIATION, THE AMERICAN PSYCHOLOGICAL ASSOCIATION, AND THE DEPARTMENT OF AUDIOVISUAL INSTRUCTION OF THE NATIONAL EDUCATION ASSOCIATION; MAY 1961:

The use of self-instructional programmed learning materials in teaching machines and similar devices represents a potential contribution of great importance to American education. But this contribution can be realized best only if users have information with which to evaluate self-instructional materials. Accordingly, the following interim guidelines have been prepared.

1. Teaching machines do not, in themselves, teach. Rather, the teaching is done by a program of instructional materials presented by the teaching machine. Any evaluation of a teaching machine thus requires an assessment of the availability and quality of programs for each type of machine, as well as its mechanical dependability.

2. A variety of programmed materials is becoming available, but not all programs will fit all machines. Thus only those programs compatible with a particular machine can be considered as available for use with it. Commercially available programs and devices are listed in the April issue of *Audiovisual Instruction,* available from the Department of Audiovisual Instruction, National Education Association, 1201 Sixteenth Street, N.W., Washington 6, D. C. (50 cents.)

3. In evaluating the specific content which a self-instructional program purports to teach, the program can be examined to determine what the student is required to do and whether this reflects the kind of competence which the educator wishes to achieve. Like other educational materials, programs labeled with the name of a particular subject matter vary widely with respect to content and instructional objectives.

4. Just any set of question-and-answer material does not constitute a self-instructional program. One type of self-instructional material proceeds by small steps requiring frequent student responses. These steps can be examined to see if they embody a careful, logical progression of the subject matter. Items in such a program are designed so that the student will respond to the critical aspects of each item or will perform the important operation which that item was meant to teach. Furthermore such programs generally provide a wide range of examples illustrating each principle or concept.

5. Self-instructional materials are designed to adapt to individual differences by allowing each student to proceed at his own rate. Some types of self-instructional programs further adapt by "branching" to alternate material. For this purpose, questions are designed to diagnose the student's needs, and to provide alternate material suited to these needs. The material is designed so that the choice of answer to a particular question determines which items will be

presented next. Incorrect answers take the student to items containing information designed to correct the error before continuing through the sequence.

6. An important feature of almost all self-instructional materials is the record of the student's responses which provides a basis for revising the program. The prospective purchaser should ask about the extent to which revision has been based on student response and how the preliminary tryout was conducted.

7. The effectiveness of a self-instructional program can be assessed by finding out what students actually learn and remember from the program. The prospective purchaser should find out whether such data are available and for what kinds of students and under what conditions the data were obtained.

8. Active experimentation with self-instructional materials and devices in school systems is to be encouraged prior to large scale adoption.

WHAT'S IN A NAME? A PROBLEM OF TERMINOLOGY

A. A. Lumsdaine and David J. Klaus

The paper that appears below was circulated to a number of educators and psychologists interested in teaching machines and programmed learning about a year ago. Some reactions and outgrowths of this essay in terminology are briefly summarized at the end of this paper. Dr. Lumsdaine, editor of this department, is professor of education at the University of California in Los Angeles; Dr. Klaus is research psychologist at the American Institute for Research in Pittsburgh.

IN COMMON WITH other individuals concerned with "teaching machines and programmed learning," "automatic teaching," "self-instructional devices," (and related concepts, techniques, and devices), we have felt that most of the descriptive and denotative terms used in this area have disadvantages in terms of connotations which are misleading, prejudicial, or both. We have also felt the need to adopt some one modifying term which can be used consistently in combination with "methods," "devices," "techniques," "materials," "media," etc., and which will represent as accurately as possible the area with which we are concerned.

After considering many alternatives, the term we propose to employ is *"auto-instructional methods"* and similar combinations of the term "auto-instructional," such as "auto-instructional devices," "auto-instructional techniques," "auto-instructional materials," and "auto-instructional concepts."

Though not ideal, this seems to us the best compromise for a term which is reasonably descriptive and has a minimum of onerous affective overtones. Our thus-far limited experience in employing

this term and trying it out on others suggests that its meaning is rather well understood, and that, with a little practice, it is readily incorporated into one's verbal repertoire. If others share this experience, we would not be surprised if "auto-instructional" turned out to be a very serviceable term for general use, regardless of any specific etymological justification. However, the following considerations concerning root connotations do seem of some relevance.

The term "auto-instructional" is meant to denote instruction which has the following characteristics:

1. It is potentially "autonomous" in the sense that it contains the features felt to be essential for dependably producing learning of a given subject matter or repertoire on the part of a student—without his necessarily receiving additional instructional assistance; that is, auto-instructional methods provide for the controlled presentation of material, the elicitation of appropriate responses, guidance with respect to the critical aspects of the subject matter, and control of the way in which learning proceeds (through use of proper sequencing, small steps, appropriate forms of reinforcement or feedback, and related features which seem to be demonstrably important for effective learning).

2. Because of the way in which auto-instructional materials should invariably be developed in order to assure that the foregoing characterization is warranted, the materials (and, more broadly, auto-instructional methods which they represent) have an automatic-regulating property as an inherent feature. This property results from the fact that in the development of the materials an essential input utilized is the responses of sample students, leading to progressive revision until the materials are seen to fulfill, in fact, the characteristics noted in number 1 above. In this sense, the prefix "auto-" refers to what might be described as an *autogenous* feature of auto-instructional programs, in that the student's responses to preliminary versions of a program sequence themselves are instrumental in generating the subsequent development of the material.

3. A third connotation is that, as in the "teaching machine," auto-instructional materials by their nature lend themselves, where desired, to presentation in some form of device which may have a considerable range of automatic or semi-automatic control features governing the sequence of presentation, the scoring or discrimination of correct and incorrect responses, etc. Thus in a broad sense, auto-instructional methods can also certainly comprehend teaching devices which depend on sophisticated internal control or feedback mechanisms rather than solely on the pre-determined sequence of an instructional "program" for achieving instruction of a student (as in some of Pask's devices).

"Instructional" has been selected as preferable to alternative terms such as "teaching," "educational," "training." "Instruction" is comprehensive enough to encompass the common elements connoted by both education (which, in its general usage, is somewhat too broad) and training (which has too narrow or technical a meaning, for most people, to include academic instruction). In addition, the term "instructional" is sufficiently comprehensive to include the range of relevant objectives and techniques, which would not be true of more particularized terms such as practice, guidance to the learner, tutoring, or "self-testing."

"Instructional materials" also seems preferable to "learning materials" (not to mention "learning machines!") because, though our orientation is more on achieving learning than on the point of view of communicating or teaching, we want to connote the effective stimulus control of learning, rather than unstructured self-study or miscellaneous forms of "learning from experience." "Instructional" further seems preferable as an adjective to "teaching," because it seems less likely to evoke apprehensive reactions from teachers as a competitive threat to them. Finally, the term "instructional materials" has the sanction of considerable prior usage without any particularly objectionable overtones; and, coupled with the prefix to form "auto-instructional," suitably differentiates the particular kind of instructional materials and methods we are concerned with from the broader total field (which would also include projectors, films, display boards, tape recordings, slides, worksheets, etc.). From the standpoint of acceptability, auto-instructional materials and auto-instructional devices seem consonant with these already well-accepted and widely used classroom aids.

Though the term "auto-instructional" is surely not free from possible shortcomings, it does seem to us to be a satisfactory and serviceable one. It offers several advantages and avoids, at least in large part, some of the prejudicial, over-restrictive, or otherwise misleading connotations of such terms as "teaching machines," "automated instruction," "automatic teaching," or "programmed instruction." The objections to "teaching machines" have been frequently mentioned: not all forms of auto-instructional methods employ machines—for example, the "programmed textbook"; the term "teaching machines" conjures up antagonistic reactions associated with "mechanization" of the intellect, thought control, and a non-humane regimentation—which, in fact, the wise use of auto-instructional methods need do nothing to foster and may do much to combat. "Automated" not only has some unfortunate clang associations with such terms as "checkmated," but focuses attention on a reaction to "automation" which suggests technological unemployment as well as a standardized, mass produced, therefore low-quality, educational-mill product. "Automatic teaching" has similar unfortunate connotations. "Self-instructional" fails to distinguish the specific attributes of what we are terming "auto-instructional" methods from mere self-study, the correspondence course, the traditional workbook, etc. "Programmed instruction" or "programmed learning" has unfortunate inflexibility and "regimentation" connotations, and also is undesirably restrictive. It further invites confusion because of the mixture of similarities and differences as between an *auto-instructional* program and a digital computer program; also, it fails to differentiate auto-instructional materials as characterized above from any other sequenced presentation, such as an educational television "program."

Other terms considered and finally discarded for various reasons include several variations on the terms tutoring, self-tutoring, automatic tutoring, and the like. Not only is there at least a minor difficulty in that these terms have been partially pre-empted for specific reference to particular commercial devices, but also, though they do have some favorable connotations (for example, privileged people have tutors;

tutorials are used at prestige universities), they also have perhaps even stronger negative connotations to many individuals, to whom "tutoring" suggests the need for special help and coaching for a child whose abilities or achievements are not up to par. It seems undesirable to foster this remedial connotation.

(Incidentally, the terms Auto-Instructional Methods and Auto-Instructional Devices fortunately abbreviate to AIM and AID!)

Postscript, May 1961

Most, though not all, of the reactions to this terminological proposal were mildly to strongly favorable. Some (like the authors) felt that "auto-instructional" is not ideal but could think of no better substitute. Eugene Galanter, who edited *Automatic Teaching: The State of the Art*, John Wiley and Sons, Inc., 1959 (the first hard cover publication in the auto-instructional field), seems to have hit on the term independently and about concurrently. Galanter used the abbreviation "AID" in a paper which later appeared in the *Teachers College Record* (December 1960). As many AVCR readers will have noted, "AID" is also used as the title of a recently promulgated news bulletin edited by H. L. Moon for INRAD (The Institute of International Research and Development). The term has meanwhile acquired considerable currency and has been employed in a number of published articles and a larger number of unpublished papers.

On the other hand, some are bothered by competing connotations of the prefix auto- (driver training is one, of course), and several have found that the term is too much of a mouthful for easy use. "Self-tutoring," "self-teaching" and "self-instructional" seem handier terms to the latter individuals, some of whom endeavor to restrict the meaning by combining these adjectival forms with the term "programs"—which, unfortunately, has a less specialized connotation among educators and the public generally than the special meaning intended by the auto-instructional program fraternity. Summary of the "AIM" terminological gambit, one year later: widely but not unanimously adopted.

—*A.A.L.*

BACKGROUND TO THE FUTURE?

TEACHING MACHINES AND PROGRAMMED LEARNING, edited by A. A. Lumsdaine and Robert Glaser (Washington, D. C.: Department of Audiovisual Instruction, National Education Association, 1960. 724 p. $7.50).

Although the editors of this source book on teaching machines and programmed learning have not unearthed a detailed description of the teaching machine patented in 1866 by a New England artisan named Haylcon Skinnar, they have performed a labor of love in bringing together in 724 pages most of the significant papers that have been published in the teaching machine field since its modern origin with Sidney Pressey in the 1920's. As one might expect, however, the majority of the works in this volume represent the present renaissance of this field initiated by B. F. Skinner in the early 1950's. In fact, a good many of the abstracts included in an excellent appendix faithfully describe much of the important research in programmed learning that has been carried on during the last two years. Also included are speculative looks into the automated schools of the future (a paper by Simon Ramo) and the "adaptive" electronic teachers that an Englishman, Gordon Pask, suggests will be common to them. Readers who are not quite ready for such a future are apt to be more prepared for it after reflecting on the scholarly and readable "Teaching Machines and Human Beings" by John Blyth, professor of philosophy at Hamilton College whose prophesies are extrapolated from the experience of actually teaching a course in logic via programmed learning.

The editors have divided the text proper into five parts; a sixth, in the form of two appendices should prove invaluable to anyone who wants to find out about other significant work in the field.

The purpose, scope, and tone of the book are set forth in Part I by the editors who have pioneered in this field. Dr. Lumsdaine, professor of education at the University of California, has supplied a straightforward overview of the field. Dr. Glaser, professor of psychology at the University of Pittsburgh, has written an enthusiastic paper which sets forth the view that "now seems to be the time for such zealotry," lest the educational revolution advocated by Pressey in the 1920's go unrealized even in the 1960's. While much of the book is representative of Lumsdaine's matter-of-fact approach, there is also an ample supply of Glaser's enthusiasm.

Part II has as its focal point the work of Sidney Pressey, and the testing-teaching devices developed by him and

refined by others prior to Skinner's inventions of the early 1950's.

Part III, the largest of the book, is devoted to papers written by members of the Harvard group who under Skinner's guidance introduced the idea of logically and psychologically sequencing learning in a way which is now commonly called "programming." By putting these carefully sequenced programs into what otherwise would be nothing more than testing devices, Skinner and his associates developed a method of teaching through a system of asking the "right" question as part of each step in the sequence. Because he is asked the "right" question, theoretically the student is able to answer it correctly. Furthermore, the student's learning is greatly strengthened or "reinforced" when he is shown that he has been correct, or corrected, if by any chance he has answered incorrectly. It is no doubt common knowledge by now that this principle of reinforcement lies at the core of Skinner's approach to psychology. The first two sections in this section—Skinner's now-famous 1954 *Harvard Educational Review* article and Douglas Porter's "Critical Review of a Portion of the Literature on Teaching Devices" are required reading for anyone who wants to understand the origins of the current excitement about programmed learning. Skinner's 1958 article, reprinted from *Science* will also be most helpful to the lay reader.

Part IV is comprised of a dozen papers that record "contributions from the military and other sources." The aforementioned Pask and Ramo articles as well as an insightful paper entitled "Technology and the Instructional Process" by James D. Finn appear in this portion of the book.

In Part V of the text proper, a representative selection of more recent work in the field is reported by some of those engaged in it. The Blyth paper is included here. Also present in a paper by Thomas Gilbert are some of the most sagacious observations in the whole volume. They are enhanced and made all the more pointed by a phenomenon unique in such a "source book"—humor. After almost 500 pages of "deprivation," Gilbert's wit can act as a strong "reinforcer." There is no question that throughout the volume devices and machines received much more attention than do learning theory or programming *per se*. Gilbert's few words, if carefully read, can go a long way toward redressing this imbalance.

This book fulfills a need for background knowledge. However, the lack of accurate up-to-date information about programmed learning is frightening when one realizes the amount of pressure currently being put upon many school administrators "to do something with teaching machines."

If this book is to be of help in fulfilling this more pressing need, it will have to be read critically and with an awareness that a good many of the papers, although justifiably included in "a source book," are already merely of historical interest. The editors have done a service in bringing this book together. This reviewer regrets the lack of a topical index. It is interesting to be able to find out that B. F. Skinner is referred to on 224 pages of the book, but such an index is not very helpful to the reader who is interested in what a number of authors have had to say about "frequency of reinforcement," "overt or covert responses," or any number of important topics. If he wants such information,

the reader must either know where to look beforehand or search it out for himself. —P. KENNETH KOMOSKI
Center for Programed Instruction, N.Y.

TEACHER IN PARLOR

TELEVISION IN THE LIVES OF OUR CHILDREN, by Wilbur Schramm, Jack Lyle, and Edwin B. Parker (Stanford, California: Stanford University Press, 1961. 324 p. $6).

The real, possible or imagined effect of television on our children has generated as much heat and as little light as any continuing event of the past two decades. From expert critic to irate, letter-writing parent, most everyone has had his say, but facts have been hard to come by. Schramm, Lyle, and Parker now have offered more light than has yet been available. But it seems certain that the heat will not be reduced.

Their substantial volume is the report of 11 field studies made between 1958-1960. Along the way, they gathered data from 5991 children, 1958 parents, and several hundred school officials and teachers. They operated in 10 different communities in the U. S. and Canada. And though they have no probability sample of the children of the United States, there should be no question on the sufficiency of these data.

A vast array of different kinds of material was obtained, from time spent with TV (and other mass media), through a variety of measures of learning, attitudes, and "social adjustment." Hundreds of analyses, some simple and some complex, have been performed. The authors have resolved the problem of this wealth of data in an interesting way: the book is in reality two volumes. The first is 194 pages of rationale, findings, and conclusions relatively free of tables and figures, but illuminated with occasionally simple charts or graphs, written with a general audience in mind. The second is 130 pages of technical appendices, almost completely made up of tables. The "first" volume is extensively keyed to the "second," so that the curious or expert can check to their fullest desires. The composite provides much more "raw data" than is usually available for a study of this kind, so that the researcher will find it possible to double check—and sometimes, even to re-analyze on the basis of his own hypotheses.

The book has already received considerable attention in the general press, and it will likely receive more. It would appear that anyone who considers television his field of specialization will have to become conversant with it.

The over-all analytic plan is indicated by these chapter headings, "How a Child Uses TV," "What a Child Uses TV For," "Learning from TV," "Reality Seeking and Social Norms," "TV and Social Relations."

The vast amount of time American children spend with TV is fully documented. That it is large is no particular surprise, but the stark statement of it is. The authors find that the child spends *as much time on TV in his first 16 years as he spends in school.* The way in which children come into the TV audience (as well as into audiences of the other mass media) is plotted out. Here the researchers have reminded us of an easily observed, but not often considered fact: modern society trains the child to be a mass media consumer.

For this reviewer, one of the most

dramatic findings comes from the Canadian study. Here, a pair of towns were studied—one with TV and one wholly without it. This large scale "field experiment" shows that TV-town first graders came to school with significantly *more vocabulary* than children of the non-TV town. The conclusion seems straightforward—the casual preschool viewing of TV does teach. Finer examination shows that the difference is confined to two subgroups—those of *above* average intelligence and those *below* average. Among these two, the gain was substantial enough to put them at the level of second graders.

The authors provide a two-factor explanation of this outcome, which bears upon the somewhat similar experimental results which have been reported from time to time. One factor is a straightforward ability hypothesis: the brighter will learn more than the duller. The second is an attention-producing (or focusing) hypothesis: the attention of the duller will be captured (and focused) more effectively for the duller than the brighter (but it will be captured for all to some extent).

The interaction of these two factors works toward a gain in learning for both extremes, the dull from being focused sufficiently on new vocabulary to overcome their slower learning rate, the bright gaining at their higher rate but from a relatively smaller amount of new material. For the average group, these two factors are countervailing; accordingly, they end up with a counterbalancing which leaves them with little or no gain.

From other evidence, the study shows that this initial advantage in vocabulary level is apparently not followed up. Sixth- and tenth-graders with and without TV show little or no differences in knowledge tests. If anything, the balance leans toward the non-TV children at later stages.

The authors put the blame for failure to utilize the potential of six-year-olds with seven-year-old vocabularies upon TV and its highly redundant, "non-reality" content. Some of this burden, this reviewer thinks, might well have been pushed in the direction of the schools, as well.

Over-all, they find TV being used by children primarily as a *fantasy* source. No great surprise here, of course, but the case is carefully developed and well documented. (Since children get a high percentage of adult TV fare, we might also extend the observation to adults.) TV has replaced other kinds of fantasy materials—comic books, pulp magazines, movies.

But before parents can react against TV, there is another general observation. One of the most powerful factors in the child's TV viewing is the social setting in which he finds himself. He uses it more or less in accordance with the *class norms* to which his parents subscribe. An important aspect of these norms is that higher socio-economic households put a higher value on print communication. Thus the higher socio-economic child, as he approaches the teens, begins to use print media to a greater extent than the lower; in turn, his use of TV declines, relatively. Critical parents, it would appear, have to look to themselves to a considerable extent.

Within this array of social forces, TV also serves individual personal needs. The child in conflict with parents, peers, or school, uses TV to a greater extent. Its fantasy content provides him another

world in which to live at low psychic cost. Is this dangerous to him as an individual? Here the study provides no clear answer, but the edge is toward "no danger." Where serious maladjustment exists, the best guess is that it would have developed, TV or no TV.

Despite these points, the findings and their interpretation in general are critical of TV. Content is too low-level, too fantasy-oriented, say the authors. The potential of TV with our children is not being realized.

AV specialists will find some things to agree with and some to disagree with in this book. For example, all data are based on verbal tests. An attempt to use a visual learning test was made, but it failed to differentiate. The findings on aggression and TV might well have been interpreted to show that TV teaches socially approved attitudes concerning aggression. There is an admission of this possibility, but it is not well developed.

Even so, this book provides fuel for argument, the factual basis for understanding, and hypotheses by the score for future experimentation and field studies. It will have a considerable impact. —PAUL J. DEUTSCHMANN
Michigan State University

CLEAR IF KNOWN

THE CONSTRUCTION OF RESEARCH FILMS, by D. H. Densham (London: Pergamon Press, 1959. 104 p. $4.50).

In the words of the author, the aim of this book 'is to help producers of research films to improve the style of their productions. The information given will apply equally to most types of short film production, including scientific films, training films, and documentary films. Some of the details will already be known to you."

Published for the NATO Advisory Group for Aeronautical Research and Development, its strength lies in the fact that it covers a great deal of material in a clear, easily understandable manner for the semi-professional or advanced amateur film maker. Its suggestions for subject-matter research, scripting, breakdown, and pre-production planning are certainly pertinent. The points stressed for the director, the cameraman, soundman, and editor are well chosen. The book ends with an adequate glossary.

This book seems best suited to the scientist who has had some contact with film making and, as noted above, already knows some of the details. The self-trained film maker who has made his initial efforts in production might well benefit from the book.

Obviously, one of the main weaknesses lies in the fact that you must already know something about film making to understand the book. If you are just starting your first major film, the book would be rather difficult, covering a great deal of material too briefly to be clear. If you are a trained film maker, it's too elementary.

To the U.S. taste, this book will seem to be old fashioned in design and lacking good diagrams and photographs. The print will seem rather small. Many of the terms will be unfamiliar or confusing to the American film maker, though much effort was made to include American and British terms.

It is difficult to refrain from comparing it with Spottiswoode, *Film and Its Techniques*, and the recent UFPA Glossary issue. Spottiswoode starts more towards the beginning of the process and

proceeds further. (Both books give hardly a line to magnetic sound recording.) The UFPA glossary is much more extensive and more suitable to the U.S. film maker.

Certainly a book to guide the scientist in simple film making as well as the student film maker is badly needed. The strength of Mr. Densham's book in covering a great deal of material is also its weakness if we apply the COIK ("Clear Only If Known") theory.

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NOTES AND COMMENT

The Process of Education by Jerome S. Bruner (Cambridge: Harvard University Press, 1960. 92 p. $2.75) is a carefully integrated report of a 10-day conference of some 35 scientists, scholars, and educators. It is organized around four themes: (1) the central role of *structure* (systems, relationships) in learning; (2) the proposition that "the foundations of any subject may be taught to anybody at any age in some form"; (3) the importance of the "training of hunches" and (4) how interest in learning *per se* can be stimulated and nurtured. The subject of communication systems, devices, and materials in teaching aroused sufficient debate and controversy to merit the final chapter.

* * *

"The Gutenberg era" is a misnomer except as applied to the fifteenth and sixteenth centuries. It took six men working six years to print the Gutenberg Bible; medieval scribes could have done almost as well. The truly explosive change in communications came with the application of mechanical power and large-scale industrial organization. Did literature survive the explosion? Is modern "popular culture" a contradiction in terms? Louis Dudek explores the first question in *Literature and the Press* (Toronto: The Ryerson Press, 1960. 238 p.) and Eric Larrabee the second in *The Self-Conscious Society* (New York: Doubleday and Co., 1960. 188 p. $3.50). Their answers (yes and no to both questions) are well worth considering as we enter new "eras" in communications.

* * *

Prospectus on Research presents an ordered summary of the research recommendations developed by the forums of the 1960 White House Conference on Children and Youth. (It is available from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D. C. for 25 cents; the full *Recommendations—Composite Report of Forum Findings* can be ordered from the same source for 35 cents.) The scope of research recommendations is indicated by the proposal that "the Federal Government develop a research program in education comparable to that of the National Institute of Health." While the National Defense Education Act provides an urgently needed stopgap measure, it falls short of filling the needs outlined in these recommendations. In the communications area, for example, the recommendations point to a research need partly outside the present scope of

Title VII of the NDEA: "The mass media are a major avenue for the transmission of American culture with vast potential as informational and educational tools for both children and adults. Research leading to a clearer insight into their complex role in our society is necessary" (p. 15). Of the 24 recommendations listed for research in education, one proposes that the National Council of Arts in Education, a subdivision of the U.S. Office of Education, "undertake a national research program on the importance of creative arts" (p. 31).

* * *

An example of leadership in appraising the mass media and the popular arts in the cultural education of a nation was the conference of scholars, media professionals, government officials, researchers, and school people sponsored by England's National Union of Teachers in October 1960. A verbatim transcript of the conference has been published under the title *Popular Culture and Personal Responsibility*. (National Union of Teachers, Hamilton House, Mebledon Place, London W.C. 1, England. 348 p. 12s 6d.) It is a remarkable document (including talks, scholarly papers, panel discussions, and remarks from the floor), well worth our scrutiny both for the information and the inspiration it might yield.

* * *

In *Freedom and Communications* by Don Lacy (Urbana: University of Illinois Press, 1961. 93 p. $3) the managing director of the American Book Publishers Council takes a broad view of our whole system of communications and makes suggestions for strengthening its freedoms. "The world to which we respond . . ." he writes in one of many passages of relevance to all communication specialists in education, "is . . . an envisioned world whose image is formed for us by the daily flow of communication in which we are bathed. On the accuracy and fullness of that popularly held image depend the wisdom and effectiveness of our public policies and the character of the future that flows from them."

* * *

Old Textbooks by John Nietz (University of Pittsburgh Press, 1961. 364 p. $6) is a scholarly history of more than books. It is a survey and description of the content of American education at a time when the texts constituted *the* course of study.

* * *

Laboratories in the Classroom; New Horizons in Science Education (New York: Science Materials Center, 1960. 96 p.) is a report by 27 science educators about a great variety of uses of many types of communication materials, situations, and processes.

* * *

Charles F. Hoban, Jr. read a paper on "Research in New Media of Education" at the National Conference on Teacher Education and New Media at the University of Michigan in January 1961 which deserves careful reading. Hoban noted some major pitfalls in the use of research in policy-making, reviewed the recent shift in the concept of media functions in learning, and summarized research in the context of social, technological, and curriculum trends. His paper, along with C. R. Carpenter's statement on learning theories and Fred T. Wilhelms' on teacher education is available in *Three Conference Working Papers* for the National Conference on Teacher Education and New Media, The American Association

of Colleges for Teacher Education, 1201 Sixteenth Street, N.W., Washington 6, D. C., free as long as they last.

* * *

New media, techniques, institutions, and processes of *mass production* in communications, may have significant functions and built-in consequences glossed over by tests and measurements designed to appraise only the anticipated or desired outcomes. "Functional Analysis and Mass Communications" by Charles R. Wright in the Winter 1960 issue of *Public Opinion Quarterly* discusses the contributions of the "functional theory" to the study of communications.

In the same issue of *POQ*, research evidence is brought to bear on the contention that "what the customer wants" is as much the end product as the starting point of communications policy. In "The Learning of Tastes" Herbert E. Krugman and Eugene L. Hartley discuss three experiments exploring the relationships between familiarity and "liking," and suggest guidelines for further experimentation.

The March 1961 issue of *The Journal of Communication* inaugurated a department on "Communication Films." This department is intended to supplement the *Bibliography of Selected Films on the Process of Communication* published by the Educational Film Library of Syracuse University in 1960, and is conducted by the author of the *Bibliography*, James P. Dee. The same issue of *The Journal* contains "General Models of Communication Research: A Survey of the Developments of a Decade" by F. Craig Johnson and George R. Klare. —*G.G.*

DOCTORAL DISSERTATIONS IN AUDIOVISUAL EDUCATION: SUPPLEMENT III

John Moldstad

This is the third supplement to "Doctoral Dissertations in Audiovisual Education" published in the Fall 1956 issue of AV COMMUNICATION REVIEW. *The first supplement appeared in the Winter 1958 issue, Vol. 6, No. 1; the second, in Vol. 7, No. 2, Spring 1959. John Moldstad is associate professor of education and head of the utilization department at the Audiovisual Center, Indiana University. He has served as assistant chairman of the Research Committee, Department of Audiovisual Instruction, NEA.*

AT A RECENT Indiana University faculty meeting, a professor introduced one of his students who had just successfully defended his doctoral thesis. The professor praised the study as one of the most outstanding to come out of his department and concluded by saying he hoped "this study wouldn't end up like most other doctoral dissertations—just gathering dust on the library shelf."

Thus, finding that 102 doctoral dissertations have been completed in the area of audiovisual communications between September 1958 and September 1960 is both heartening and discouraging. Heartening because it shows evidence of sustained interest in research as a way of evaluating the impact made by the new communication media and also because it serves as a benchmark indicating the number of potential leaders who have completed advanced training in various aspects of audiovisual communications research. The discouraging part is that there is ample evidence that a great number of these dissertations do become mere place-holders in the library stacks.

To what extent are doctoral research studies in audiovisual communication relegated to oblivion? In an attempt to arrive at some estimate, the author analyzed bibliographies of seven selected major summaries of audiovisual research and (as shown in Table 1) noted the extent to which doctoral dissertations were listed as primary sources.

There may be a number of reasons why only 88 bibiographical references of doctoral dissertations appeared in the 1402 bibliographical entries of these seven major research summaries shown in Table 1. Scarcity, however, is not one

TABLE 1—BIBLIOGRAPHIES OF SELECTED MAJOR SUMMARIES OF AV RESEARCH

Bibliographies	*Total Bibliographical Entries*	*Doctoral Dissertations Included*
1. Allen, William H. "Audio-Visual Communications." *Encyclopedia of Educational Research.* (Edited by Chester W. Harris.) New York: The Macmillan Co., 1960. p. 115-37.	320	25
2. Dale, Edgar; Finn, James; and Hoban, Charles F., Jr. "Audio-Visual Materials." *Encyclopedia of Educational Research.* (Edited by Walter S. Monroe.) New York: The Macmillan Co., 1950. p. 84-96.	120	9
3. Fry, Edward B.; Bryan, Glenn L.; and Rigney, Joseph. "Teaching Machines: An Annotated Bibliography." *AV Communication Review,* Vol. 8, No. 2 (Supplement 1), 1960, 80 p.	121	5
4. Hoban, Charles F., Jr., and Van Ormer, Edward B. *Instructional Film Research 1918-1950.* Technical Report SDC 269-7-19. Port Washington, Long Island, New York: Special Devices Center, Office of Naval Research, 1950.		
5. Holmes, Presley D. *Television Research in the Teaching-Learning Process.* Doctor's thesis. Detroit, Michigan: Wayne State University, 1959. 152 p.	226	10
6. Kumata, Hideya. *An Inventory of Instructional Television Research.* Ann Arbor, Michigan: Educational Television and Radio Center, 1956. 155 p.	244	6
7. May, Mark, and Lumsdaine, Arthur. *Learning from Films.* New Haven: Yale University Press, 1958. 357 p.	75	9
	1402	88

of them. The 102 studies included in the listing which follows plus those published in the Fall 1956, Winter 1958, and Spring 1959 issues of AV COMMUNICATION REVIEW total 762. Some of these doctoral studies may have been rejected by the reviewers as unworthy. A relatively small but very important percentage which had been published in revised form were listed in the bibliographical references as journal articles.

It is the author's contention, however, that the great majority of these dissertations failed to appear simply because they were inaccessible to the reviewers. Researchers in audiovisual communications generally have only two major sources of doctoral studies—university inter-library loan and purchase of microfilms listed in *Dissertation Abstracts.* Inter-library loan is slow, expensive, and usually gives the researcher use of the dissertation for only a short period of time. Furthermore, the majority of institutions with doctoral programs have discontinued inter-library loan services for dissertations, thus leaving the researcher with only one avenue of access —purchase of microfilm copies from University Microfilms at Ann Arbor. At 1¼ cents per page, a 200-page doctoral dissertation costs $2.50. Under these conditions, reviewing doctoral research is bound to be cumbersome and costly.

How can this condition be remedied? One possible solution might be the crea-

tion of national or regional depositories where multiple copies of microfilms of all doctoral dissertations could be produced. These microfilms could then be made available to researchers for a small rental charge through a system similar to that used by film rental libraries. This or some similar plan seems imperative in order to facilitate better use of a research potential now largely neglected.

Sources and Scope

Letters requesting listings of doctoral dissertations in audiovisual communication completed between September 1958 and September 1960 were sent to deans of schools of education and heads of education departments in all U. S. colleges and universities known to grant doctoral degrees in education. Deans of selected graduate schools, schools of communication, and schools of journalism also received inquiries. *Dissertation Abstracts* and Phi Delta Kappa's *Research Studies in Education* for 1958 and 1959 served as additional sources.

As in the previous compilations, the bibliographical listings were confined to: (a) studies dealing with the effects of audiovisual materials on learning, attitude formation, and human behavior in general, with the term "audiovisual materials" used in a broad sense so as to include not only educational but also commercial films, filmstrips, radio, television, comics, graphs, charts, pictures, and so on; (b) doctoral dissertations concerned with evaluative or analytical studies of audiovisual administration—such as organizational structure, finance, selection, and distribution practices; and (c) other studies dealing with the structure and organization, content characteristics, audience, and effects of commercial and educational media of mass communication.

Method of Classification

The author has again attempted to classify each bibiographical listing within the following broad categories:

A. Administrative

1. Administrative structure and practices—status and evaluation of audiovisual programs

2. School plant facilities—provisions for audiovisual education

B. Audience

1. Characteristics and habits—the characteristics and listening, reading, and viewing habits of various types of audiences

2. Methodology—audience research methods

C. Media and Materials

1. Content—studies of either the content of the media or of specific units of material or both

2. Nature, structure, history—analytical or survey approaches in these areas

3. Use and evaluation (nonexperimental)—programs of use in specific areas; analysis and evaluation of materials and their uses

D. Effect Studies

1. Media—experimental studies dealing with the use of a specific medium or of media and analysis of the effects on a particular audience

2. Variables—experimental studies involving the following interrelationships: (a) Stimulus constant and audiences or audience characteristics varied; (b) Stimulus varied and audiences or audience characteristics constant; (c) Both stimulus and au-

diences or audience characteristics varied

3. Utilization — experimental comparison of the effects of different methods of use of materials and/or media

4. Methodology—studies of methodology in appraising effects

E. Teacher Training

1. Methods and programs—audiovisual instruction as applied to teacher training

2. Teacher characteristics—attitudes regarding media and/or audiovisual instruction, and studies of desired competencies.

Interpretation of Findings

Analysis of the titles of dissertations completed in audiovisual communication from September 1958 to September 1960 plus an acquaintance with a considerable number of the school studies leads the author to the following conclusions regarding trends in doctoral research:

1. Open- and closed-circuit television continues to be the most frequent medium investigated by doctoral students, with about 30 percent of the studies listed dealing with various aspects of television's role in education.

2. Studies concerned with the role or contribution of educational motion pictures to instruction were the second most prevalent type, constituting about 20 percent of all studies reported.

3. A substantial increase in studies investigating multi-media approaches in the teaching of various subject areas probably reflects the growing national interest in programming and the various systems approaches to learning.

4. There seems to be increased effort to undertake studies involving previously neglected media such as filmstrips, tape recordings, transparencies for the overhead projector, and locally-produced graphic and three-dimensional materials.

5. As yet, there appears to be few doctoral dissertations investigating the effectiveness of either teaching machines or language laboratories in improving instruction.

DISSERTATIONS IN AV EDUCATION: SEPTEMBER 1958 TO SEPTEMBER 1960

(C-3)* 1. APPELL, CLARA TAUBMAN. *Television's Impact upon Middle Class Family Life*. New York: Columbia University, 1959.

(C-3) 2. AS, MARTHINUS LUTHER VAN, *Differential Roles of the Press and the Radio in an Extension Program in the Union of South Africa*. Ithaca: Cornell University, 1959.

(C-2) 3. AUSTIN, HENRY ROOT. *History of Broadcasting at the National Music Camp Interlochen, Michigan, 1929-1958*. Ann Arbor: University of Michigan, 1959.

(D-1) 4. BAILEY, HERBERT STERNBERGH. *Teaching Physics on Closed-Circuit Television*. Syracuse: Syracuse University, 1958.

(C-3) 5. BALLEW, CARMEL WILLIAM. *An Investigation of the Use of Audio-Visual Teaching Materials from the Audio-Visual Department of the University of Missouri by the Schools in Missouri*. Columbia: University of Missouri, 1960.

* The abbreviations in parentheses refer to categories defined in Method of Classification.

(C-1) 6. BALL, CHARLES E. *Filmed Demonstrations for Industrial Arts; Sound Motion Pictures of Selected Industrial Arts Demonstrations Which May Be Used as a Teaching Device.* New York: New York University, 1959.

(A-1) 7. BECKOFF, SAMUEL. *An Inquiry into the Operative Principles Applicable to the Licensing of Motion Pictures in New York State.* New York: New York University, 1959.

(B-1) 8. BENCETIC, STEPHEN THOMAS. *Picture Preferences of Elementary Children.* University Park: Pennsylvania State University, 1959.

(E-1) 9. BENEDICT, JOEL AVERY. *The Development of an In-Service Training Program in Audio-Visual Methods Through Television.* Stanford: Stanford University, 1959.

(C-1) 10. BLUEM, ALBERT WILLIAM. *The Influence of Medium upon Dramaturgical Method in Selected Television Plays.* Columbus: Ohio State University, 1959.

(C-2) 11. BOLIE, PAUL EUGENE. *Technological Instruments of Communication in Small Schools.* New York: Columbia University, 1959.

(C-2) 12. BROWN, ROBERT. *Programing a Film Series: A Case Study Analysis of Factors Effecting the Cost of Selected Methods of Distributing Film Series.* Bloomington: Indiana University, 1960.

(C-1) 13. BURDICK, JOHN GORDON. *A Study of Cross-Section Drawing in High School Science Textbooks.* Syracuse: Syracuse University, 1959.

(C-3) 14. CARLSON, FREDERIC ROY. *The Design, Production, and Evaluation of a Vocational Guidance Film on Occupations for the Quincy School System.* Boston: Boston University, 1959.

(D-2) 15. CARTER, CHARLES BRUCE. *The Relationships Between Children's Drawings and Sensitivity to Environmental Sounds.* University Park: Pennsylvania State University, 1958.

(D-2) 16. COBUN, TED C. *The Relative Effectiveness of Three Levels of Pictorial Presentation of Biological Subject Matter on the Associative Learning of Nomenclature by Sixth-Grade Students.* Bloomington: Indiana University, 1960.

(D-1) 17. COHEN, LOUIS. *An Evalution of a Technique To Improve Space Perception Abilities Through the Construction of Models by Students in a Course in Solid Geometry.* New York: Yeshiva University, 1959.

(B-1) 18. CONLEY, VERONICA LUCEY. *Resistance to Inaccurate Information in the Mass Media.* Chicago: University of Chicago, 1959.

(A-1) 19. CORNFIELD, RUTH R. *The Audio-Visual Departments of Foreign Information Services in New York.* New York: New York University, 1959.

(D-1) 20. COX, ALBERT FRISBIE. *The Use of the Magnetic Tape Recorder on Student Ability To Read Poetry.* Los Angeles: University of California, 1959.

(C-2) 21. CROSS, LIVINGSTON. *Past Development and Present Status of the Alabama Educational Television Network.* University: University of Alabama, 1958.

(C-3) 22. DALY, CHARLES CORNELIUS. *A Handbook of Techniques in the Local Production of Visual Materials.* New York: Columbia University, 1959.

(B-1) 23. DAVITZ, LOIS JEAN. *The High School Student's Perception of Most-Liked and Least-Liked Television Figures.* New York: Columbia University, 1959.

(C-2) 24. DOSTAL, NAIDA M. *Audio-Visual Second-Language Learning.* Detroit: Wayne State University, 1960.

(C-2) 25. DRURY, FRANCIS A. *An Evaluation of Visual Aids in the Teaching of Tumbling.* Iowa City: State University of Iowa, 1959.

(D-1) 26. DUKE, BEN C., JR. *An Analysis of the Learning Effects of Differential Treatment upon Above- and Below-Average College Students Enrolled in a Closed-Circuit Television Course.* University Park: Pennsylvania State University, 1959.

(D-2) 27. DUNHAM, MORTON D. *An Experimental Study of the Effects of Two Discussion Techniques on Educational Outcomes in a Beginning Educational Psychology Class Taught by Closed-Circuit Television.* East Lansing: Michigan State University, 1958.

(D-1) 28. ENDERS, DONALD E. *Academic Achievement in Grade-Six Science Resulting from Supplementary Instruction by Open-Circuit Television.* University Park: Pennsylvania State University, 1960.

(C-3) 29. FALCONER, GEORGE ALEXANDER. *A Mechanical Device for Teaching Word Recognition to Young Deaf Children.* Urbana: University of Illinois, 1959.

(A-1) 30. FARIS, KENNETH GENE. *An Appraisal by Indiana Educators of the Educational Value of Proposed Audio-Visual Student Assistant Activities.* Bloomington: Indiana University, 1959.

(D-1) 31. FARMER, RONALD JAMES. *The Effects of Selected Film Sequences on Individuals Toward Nature and Art Forms.* University Park: Pennsylvania State University, 1958.

(C-1) 32. FELL, JOHN LOUIS. *A Comparison Between Sponsored and Educational Motion Pictures; A Study of High School Biology Films Issued in the United States in 1955.* New York: New York University, 1959.

(D-2) 33. FLEMING, MALCOLM. *An Experimental Exploration of Three Communicator Strategies for Increasing the Predictability of Pictorial Cue: Verbal Response Relationships.* Bloomington: Indiana University, 1960.

(C-2) 34. FUSCO, GENE C. *The Preparation of Visual Instructional Materials for Selected Areas in Educational Administration.* Nashville: George Peabody College for Teachers, 1958.

(D-1) 35. GEORGIADY, NICHOLAS PETER. *Vocabulary Growth in the Elementary Social Studies as Influenced by the Use of Selected Audio-Visual Materials.* Madison: University of Wisconsin, 1959.

(D-1) 36. GOULD, ORRIN EVERETT. *The Character of Observation Under Closed-Circuit Television, Classroom Visitation, and Instructional Films in an Introductory Education Course.* Minneapolis: University of Minnesota, 1960.

(D-2) 37. GRAUNHE, WILLIAM LLOYD. *Effects of Visual-Auditory Presentation on Memorization by Children with Hearing Impairment.* Evanston: Northwestern University, 1959.

(D-1) 38. GRIFFITH, BARTON LOVEWELL. *A Comparison of Predicted and Actual Audience Reaction to Four Educational Television Programs.* Ann Arbor: University of Michigan, 1959.

(C-2) 39. GRILLS, JANE E. *Criteria for Appraising the Use of Television by State Universities.* East Lansing: Michigan State University, 1959.

(A-1) 40. HEDDEN, CARYL G. HEDDEN. *Organization and Administrative Adjustments for Effective Elementary School Utilization of In-School Telecasts.* Buffalo: University of Buffalo, 1960.

(C-2) 41. HEFZALLAH, IBRAHIM MIKHAIL HANNA. *Adoption of Educational Films.* Columbus: Ohio State University, 1959.

(E-2) 42. HIBBS, ELVIN LEON. *Value-Attitudes of Administrators, Teachers and Students Concerning Instructional Television Classes.* Norman: University of Oklahoma, 1959.

(C-1) 43. HILLIARD, ROBERT L. *Concepts of Dramaturgical Technique as Developed in Television Adaptations of Stage Plays.* New York: Columbia University, 1959.

(A-1) 44. HOYES, JACK. *A Survey of Audio-Visual Programs in 14 State Teachers Colleges of Pennsylvania.* Philadelphia: University of Pittsburgh, 1960.

(C-2) 45. HOLMES, PRESLEY D., JR. *Television Research in the Teaching-Learning Process.* Detroit: Wayne State University, 1959.

(A-1) 46. HUBBARD, RICHARD DEAN. *A Study of the Reasons Given for the Limited Use of Certain Audio-Visual Materials at Syracuse University.* Syracuse: Syracuse University, 1960.

(D-2) 47. KANTOR, BERNARD R. *An Exploratory Study of the Effects of Inserted Questions in the Body of Instructional Films.* Los Angeles: University of Southern California, 1959.

(C-1) 48. KASTEN, DUANE FRANK. *A Study of Five Factors Influencing the Legibility of Televised Characters.* Lafayette: Purdue University, 1960.

(E-1) 49. KAZEM, AHMED KHAIRY MOHAMED. *An Experiment with Closed-Circuit Televised Instruction in Teacher Education.* Ann Arbor: University of Michigan, 1960.

(E-2) 50. KELLEY, GAYLEN BERTON. *An Analysis of Teachers' Attitudes Toward the Use of Audio-Visual Materials.* Boston: Boston University, 1959.

(D-2) 51. KING, CALVIN ELIJAH. *A Comparative Study of the Effectiveness of Teaching a Course in Remedial Mathematics to College Students by Television and by the Conventional Method.* Columbus: Ohio State University, 1959.

(E-1) 52. KNAPP, AUSTIN C. *An Analysis of Trends in Selected Graduate Audio-Visual Education Programs.* Bloomington: Indiana University, 1960.

(C-2) 53. KOLASA, VICTOR M. *The Preparation of Graphics Including Vidicon Gray Scale Equivalents of Scenic Colors Used in Television in Educational Institutions.* East Lansing: Michigan State University, 1959.

(B-1) 54. LEWIS, ALICE JUANITA. *An Inventory of the Auditory and Visual Discrimination Abilities of Beginning Kindergarten Children.* Columbus: Ohio State University, 1959.

(C-2) 55. LOYD, JAMES WALTER. *Materials, Methods and Techniques Used in Teaching General Business.* Lexington: University of Kentucky, 1955.

(D-1) 56. LOTTES, JOHN J., JR. *The Effects of Open-Circuit Television Demonstrations of Reading Instruction on the Observed Classroom Performances and Attitudes of Teachers.* University Park: Pennsylvania State University, 1960.

(E-1) 57. LUX, JOHN ELTON. *Teaching Methods and Activities Used by Social Studies Teachers Rated as Superior by Their Administrators.* Lincoln: University of Nebraska, 1959.

(D-1) 58. LYDEN, SISTER M. DOROTHEA, O.P. *The Effectiveness of Films and Filmstrips in Teaching Junior High School Mathematics.* New York: Fordham University, 1959.

(A-1) 59. MCCARTHY, HENRY ROSAMOND, JR. *An Appraisal of Selected Aspects of County Audio-Visual Service Centers in the United States.* Lubbock: Texas Technological College, 1959.

(D-2) 60. MCCARTHY, WILLIAM GROVER. *A Comparison of Discussion and Role Playing as Techniques for Influencing Children's Thinking About Social Values.* Stanford: Stanford University, 1959.

(A-1) 61. MCMAHON, ROBERT SEARS. *Federal Regulation of the Radio and Television Broadcast Industry in the United States, 1927-1959, with Special Reference to the Establishment and Operation of Workable Administrative Standards.* Columbus: Ohio State University, 1959.

(D-1) 62. MCPHERSON, CLINTON M. *The Effect of Sound Motion Pictures as Measured by Differential Achievement on the Motivation of College Freshman Chemistry Students.* Lubbock: Texas Technological College, 1959.

(C-1) 63. MAGRUDER, JANE NOEL. *Development of the Concept of Public Interest as It Applies to Radio and Television Programming.* Columbus: Ohio State University, 1959.

(C-3) 64. MIKELL, ALFRED MILLER. *The Contribution of Audio-Visuals to Evangelism in Religious Education.* Fort Worth: Southwestern Baptist Theological Seminary, 1959.

(C-3) 65. MILLER, HOWARD LELAND. *Procedures for Improving the Use of Publications in the Communications Process by Professional Leaders in Agricultural Education.* Columbus: Ohio State University, 1959.

(D-1) 66. MOH, E. R. *An Experimental Study Testing the Value of Using Multi-Sensory Experiences in the Teaching of Measurement Units on the Fifth and Sixth Grade Level.* University Park: Pennsylvania State University, 1959.

(C-2) 67. MORLAN, JOHN EDMUND. *A Comparison of Theory and Practice in the Use of the Educational Film.* Lubbock: Texas Technological College, 1959.

(D-1) 68. MURRAY, J. R. *The Comparative Effectiveness of Condensed Visualized Methods Versus Taped-Demonstration Methods in Teaching Operation of the VM Tape Recorder and Victor 16mm Projector.* University Park: Pennsylvania State University, 1960.

(C-2) 69. NIVEN, HAROLD FRANKLIN, JR. *Instructional Television As a Medium of Teaching in Higher Education.* Columbus: Ohio State University, 1958.

(C-3) 70. PAGE, JAMES LEE. *The Production of a Community Development Film "Racine Lakeshore Development" and Its Effect on Opinions of Local Viewers.* Madison: University of Wisconsin, 1959.

(E-1) 71. PASCOE, DAVID O. *An Analytical Study of Audio-Visual Teacher Education in California.* Los Angeles: University of California, 1959.

(A-1) 72. PERRY, LUCY C. *A Study of the Organization and Utilization of Audio-Visual Materials in Educational Programs in Nursing for Registered Professional Nurses, with Recommendations for Improvement.* Bloomington: Indiana University, 1959.

(C-3) 73. PHILLIPS, ANDERSON JOHN. *A Study Designed To Determine the Spelling Learnings Which May Be Attributed to a Specific Series of Spelling Lessons Presented by Television.* St. Louis: Washington University, 1959.

(C-3) 74. RIKER, CHARLES VINCENT. *A Homeviewed Educational Television Series for Young Children.* New York: Columbia University, 1959.

(D-2) 75. ROBINSON, PAUL VIRGIL. *An Experimental Study of Exhibit Arrangements and Viewing Methods To Determine Their Effect upon Learning of Factual Material.* Los Angeles: University of Southern California, 1960.

(E-1) 76. ROSEN, HENRY. *A Course of Study in Audio-Visual Education Based on an Opinion Poll.* Boston: Boston University, 1960.

(D-1) 77. ROTTMAN, LEON. *The Effectiveness of High School Television-Correspondence Instruction.* Lincoln: University of Nebraska, 1960.

(B-1) 78. SABAH, FRANKLIN DAVID. *The Use of the Semantic Differential Technique in the Analysis of the Images of Three Columbus Commercial Television Stations.* Columbus: Ohio State University, 1959.

(B-1) 79. SCHELLER, FRED, JR. *A Comparative Study of the Differences in Student Attitudes Toward History and Chemistry Television Courses.* Eugene: University of Oregon, 1959.

(B-1) 80. SCHOR, THEODORE. *Some Variables Among Elementary School Teachers That Affect the Utilization of Audio-Visual Materials.* New Brunswick: Rutgers University, 1959.

(C-2) 81. SCHUBERT, CHARLES LOYD. *The Role of Audio-Visual Media in the Public Relations of Colleges of Teacher Education.* Lincoln: University of Nebraska, 1959.

(D-2) 82. SCHULMAN, MILTON. *The Effect on Learning of Two Types of Film Introductions in Ninth-Grade General Science.* New York: New York University, 1959.

(C-3) 83. SCOTT, DONALD THOMAS. *An Analysis of Teacher and Student Opinions of an Experimental Method of Teaching High School Physics Through the Use of Films as Compared to Traditional Methods.* Madison: University of Wisconsin, 1959.

(C-3) 84. SPOH, CHARLES L., JR. *An Exploration in the Use of Recorded Teaching Material To Develop Aural Comprehension in College Music Classes.* Columbus: Ohio State University, 1959.

(D-1) 85. STAMPER, SILAS SHELBURNE. *The Relationship Between Information and Attitude of Education Students Toward Audio-Visual Materials as Affected by the Introduction of a Communications Media Package into Existing Methods Classes.* Bloomington: Indiana University, 1960.

(C-3) 86. STEELE, ROBERT SCOTT. *An Experimental Approach to the Production of a Motion Picture Surveying the Sarvodaya Movement in India.* Columbus: Ohio State University, 1959.

(A-1) 87. STEPP, ROBERT E. *A Study of the Instructional Communicative Resources Employed in Selected Basic Courses Offered at Institutions of Higher Learning.* Lincoln: University of Nebraska, 1960.

(D-1) 88. STEIN, SARAH CRISTINE. *An Experimental Study of the Use of Motion Picture Film Loops in the Instruction of Beginning Typewriting.* Los Angeles: University of Southern California, 1958.

(E-2) 89. STOOPS, BETTY. *Audio-Visual Competencies Useful in Teaching Four Subjects in the Intermediate Grades.* Bloomington: Indiana University, 1960.

(B-1) 90. SUGIYAMA, SADAO. *Flicker-Fusion Studies of Visual Fatigue in the Observation of Educational Motion Pictures.* Ann Arbor: University of Michigan, 1959.

(D-1) 91. SWICK, DANA F. *The Value of Multi-Sensory Learning Aids in the Teaching of Arithmetical Skills and Problem Solving—An Experimental Study.* Evanston: Northwestern University, 1959.

(C-3) 92. SYBIL, MARIE KUHNEN. *The Effectiveness of Field Trips in the Teaching of General Botany.* New York: New York University, 1960.

(E-1) 93. THOMAS, FRANCIS ASHE. *Philosophies of Audio-Visual Education as Conceived in a University Center and by Selected Leaders.* Bloomington: Indiana University, 1960.

(C-3) 94. TOMLINSON, WILLIAM HENRY. *An Analysis of Adult Interpretation of Sight and Sound Impressions and Their Application to the Media of Television.* East Lansing: Michigan State University, 1958.

(C-2) 95. TRUSCOTT, NATALIE A. *The Empire State F-M School of the Air, 1947-1957; A Historical Account of the Origin, Growth and Development of the Empire State F-M School of the Air.* Buffalo: University of Buffalo, 1959.

(C-1) 96. VAUGHN, JAMES SAWYER. *A Documentary Film on the Institute of Logopedics.* Austin: University of Texas, 1959.

(C-2) 97. VETTER, RICHARD H. *A Study of the Significance of Motion in Educational Film Communication.* Los Angeles: University of California, 1959.

(C-3) 98. VOORHIES, WILLIAM T. *An Analysis of Pupil and College Student Opinions Concerning the Use of Closed-Circuit Television for Observation of Instruction at Indiana University.* Bloomington: Indiana University, 1960.

(D-1) 99. WEISGERBER, ROBERT A. *The Effect of Science Motivational Films on the Attitudes of Secondary School Pupils Toward the Field of Science.* Bloomington: Indiana University, 1960.

(D-1) 100. WELLS, DAVID W. *The Relative Effectiveness of Teaching First-Year Algebra by Television-Correspondence Instruction.* Lincoln: University of Nebraska, 1959.

(D-4) 101. WILLIAMS, FRED EARL. *An Experimental Comparison of Equivalent Verbal and Verbal-Pictorial Tests in a University Audio-Visual Course.* Bloomington: Indiana University, 1960.

(E-1) 102. WINSTON, FRED. *A Study of the Development of Teacher Training in the Skills for the Production of Audio-Visual Instructional Materials: As Exemplified by the Courses of Study in the Accredited Teacher-Training Colleges of the Northwest Region of the United States from 1920 to 1952.* New York: New York University, 1960.

■ FILMS

Merrill, Irving R.

Films in Driver Education. East Lansing: Michigan State University Highway Traffic Safety Center. 40 p.

Purpose: To determine how educational films were used in Michigan to accomplish objectives of high school courses in driver education. The study undertook to measure the amount of film use, determine the film titles involved, and evaluate the skill employed in their utilization.

Procedure: Questionnaires were mailed on May 21, 1959 to 1228 driver training instructors. Thirty-five per cent responded by June 10, and a follow-up letter was mailed to the other 65 percent. A stamped return addressed postcard was enclosed for respondents to indicate their summer address and willingness to complete the questionnaire. This resulted in an ultimate return of 547 questionnaires or a return of 45 percent.

Results: Michigan driver education classes were shown to utilize 18 percent more educational films than the national average as measured in the spring of 1958. The average instructor used ten films with major emphasis on driving skills, the driver, and the car, and with minor emphasis on the traffic problem, traffic laws, and enforcement. A relatively small number of the 250 available traffic safety films were shown; 13 film titles accounted for 57 percent of all showings. "School size, rather than geographical location, was related to frequency of showing, with more instructors in larger schools using films than in smaller schools." The study recommended that (1) classroom instructors improve their ability to utilize films effectively, (2) producers of educational films study and use the findings of this report in future film production, (3) Michigan State University Highway Traffic Safety Center expand the announcement and description of new film titles, and (4) a continuing series of regional workshops in driver education audiovisual training techniques be instituted.

— H. H. McAshan

■ SENSORY ABILITIES

Reese, E. P.; Robinson, H. B.; Stevenson, J. G.; and Volkman, J.

Relative Effectiveness of Presenting Information to Selected Sense Modalities. Technical Report NAVTRADEVCEN 512-1. Research by the Psychophysical Research Unit, Mount Holyoke College, for the U. S. Naval Training Devices Center, Port Washington, New York; June 1960. 83 p.

Purpose: To determine the relative effectiveness of presenting information to different sense modalities as a function of the number of stimuli presented and the rate at which they are presented.

Procedure: The task consisted of counting successive stimuli presented visually, aurally, and tactually and in combinations of these sense modalities. The visual stimulus was

a narrow, vertical light flash; the auditory stimulus, a sharp click; and the tactual stimulus, a mechanical pressure applied to the forefinger. Effectiveness was evaluated in terms of accuracy and variability among subjects in the performance of these tasks.

Results: Auditory stimuli were counted more accurately than tactual or visual stimuli. Tactual accuracy was superior to visual except at very high rates. Accuracy decreased and the responses became more varied as the number and rate of presentation increased. The accuracy rate was 6.5 auditory stimuli and 4 tactual stimuli counted accurately per second. Only 40 percent of the visual stimuli were responded to correctly at the lowest rate of 2.5 flashes per second. *—L. Twyford*

■ TELEVISION

Asher, James J.

"An Investigation of Some Aspects of the Social Psychological Impact of an Educational Television Program." *Journal of Applied Psychology* 43:3, 166-69; 1959.

Purpose: To determine whether or not attitude changes resulting from exposure to an educational television program were (a) a function of the prestige of the source (i.e., national network versus local educational station), and (b) predictable from a particular personality measure (i.e., dogmatism scale).

Procedure: The *Osgood Semantic Differential* was administered to 113 undergraduate college students to measure their attitudes towards program content before and after exposure to the program.

Results: The program produced significant attitude changes for central concepts within the content, but none of the influence was shown to be a function of the prestige factor (i.e., local station versus network). Furthermore, the *D* scale was not able to predict attitude changes. *—J. J. Asher*

Burger, Elizabeth

The Use of Television for Inservice Teacher Training. Doctor's thesis. Charlottesville: University of Virginia, 1960.

Purpose: To determine whether pupils taught by teachers receiving televised instruction in certain science subject matter learned more or less than pupils taught by teachers not receiving such instruction.

Procedure: Thirty-four teachers and their 1039 fifth-grade pupils were randomly assigned to experimental and control groups for the study of electricity. Each teacher served alternately as experimental and control teacher for the study of electricity and machines.

Teachers in the experimental group viewed three half-hour television programs on the specified subject before the classroom instruction. Teachers in both experimental and control groups were provided with a "Science Guide." Eight instructional periods of 30 minutes were devoted to teaching each of the two units in the classroom by both the experimental and control teachers.

Tests of mental maturity and subject matter on electricity and machines provided the bases for comparing the pupils before the periods of instruction. A post-test was administered to the pupils to provide evidence of gain in knowledge of subject matter following classroom instruction. The *t* test was used to establish the statistical sig-

nificance of the differences which existed between the groups of pupils. Significance was determined at the .01 level of confidence.

Results: Pupils of teachers who received planned instruction on electricity by television learned significantly more about electricity than pupils of teachers who had not received such instruction. Pupils of teachers who received planned instruction on machines by television learned as much about machines as pupils of teachers who had not received similar instruction. —*E. Burger*

■ TYPEWRITER

Erickson, Lawrence W., and Clow, Cletus

The Manual Portable Typewriter as a Tool of Learning with Fifth-Grade Elementary School Pupils. New York: Teachers College, Columbia University, 1959. 85 p.

Purpose: To determine the nature and extent of educational values that may develop from the use of manual portable typewriters with fifth-grade pupils. Specifically, this study attempted to answer the following questions: (1) What levels of typewriting skill can be achieved by pupils of varying ability? (2) What are the reactions of the pupils, teachers, and parents involved toward the use of the typewriter? (3) What effects does the use of the typewriter in the elementary school classroom have on selected learning experiences of pupils at the fifth-grade level?

Procedure: Two groups of fifth-grade pupils (an experimental and a control group) at the Henry Barnard Elementary School in New Rochelle, New York were selected to participate in this study. These pupils were matched on the basis of sex, intelligence test scores, and parental socio-economic status. A pre-study testing program was administered to the experimental and control groups before the portable typewriter was introduced with the experimental group. These tests measured vocabulary, reading comprehension, intelligence, handwriting, and skills in language, work-study, and arithmetic. These same tests (or their equivalents), with the exception of the intelligence test, were re-administered at the conclusion of the study.

Extensive observations of both groups were made in their regular classrooms to give them ratings concerning attention and oral contributions in class, application to written work, and relationships with others. The teachers of the control and experimental groups were matched by subjective ratings given to them by the principal and by observation of their teaching methodology and procedures. The use of the manual portable typewriter with the experimental group constituted the experimental variable which was used as the treatment for the experimental group.

Results: Analysis of the results revealed that (1) fifth-grade pupils could learn typewriting skills, (2) pupils with higher IQ's can type faster, more accurately, and apply their typewriting skill better in composition, (3) the more intelligent students used better typing techniques, and (4) the typing rates of speed exceeded the handwriting rates in all cases.

Reactions of people involved in the experiment included enthusiastic acceptance by the fifth-grade pupils, favorable teacher impressions concerning quantity and neatness of work, and a highly favorable parental attitude toward the use of the typewriter at the elementary school level.

Among the educational effects revealed by the experiment were: (1) no significant difference in general academic achievement by either group, (2) no significant difference in learning to spell a selected list of words, (3) capitalization, punctuation, speed of composition, and quantity of written work all had differences within the .05 level of significance in favor of the experimental group. —*H. H. McAshan*

Research Abstracts and Analytical Review

of Completed Projects: National Defense Education Act, Title VII

INSTALLMENT I

PUBLISHED BY THE DEPARTMENT OF AUDIOVISUAL INSTRUCTION
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FOREWORD

On January 3, 1961, the U. S. Office of Education entered into a contract with the Department of Audiovisual Instruction for services related to disseminating the results of research conducted under the provisions of Title VII, Part A, of the National Defense Education Act. If the full benefits of educational media research conducted under NDEA are to be realized and are to have a desirable effect on future research and practice, it is imperative that the findings be accessible. The service called for under this contract is one link in the total Title VII dissemination plan.

The contractor is responsible for (a) preparing abstracts on every completed Title VII research project, following a uniform style and maintaining a high level of reliability; (b) publishing quarterly compilations of all abstracts; and (c) accompanying each quarterly compilation with a critical review or essay by a qualified researcher or educator, pointing up the significance of studies included and relating them to earlier research and that in progress.

Quarterly compilations starting with this issue will be inserted in AV COMMUNICATION REVIEW *and thereby reach its subscribers. Copies of the compilations will be mailed by the U. S. Office of Education to its mailing lists, and single copies made available at a handling fee of 35 cents from the Department of Audiovisual Instruction, National Education Association, 1201 Sixteenth Street, N.W., Washington 6, D. C.*

Through the Documents Expediting Project of the Library of Congress, the full research reports are made available on inter-library loan from cooperating libraries. A list of the current 58 libraries is appended. In addition, complete reports can be obtained on microfilm for 1¼ cents per page (minimum charge, $2.75), or on 5½"x8" pages by xerography for

4½ cents per page (minimum charge, $3). Orders should be sent to University Microfilms, Inc., 313 North First Street, Ann Arbor, Michigan, using the order number which is given with each project abstract. Abstracts of the full research reports, providing the information, number, and price of each type of reproduction, will appear in DISSERTATION ABSTRACTS *published by University Microfilms. They will be carried in a separate section at the back of each issue.*

William H. Allen, editor of AV COMMUNICATION REVIEW, *will also function as abstractor for these compilations. The author of the critical essay will probably vary with each issue, depending on the content of the reports reviewed.*

In publishing these compilations, the editors of AV COMMUNICATION REVIEW *are themselves "experimenting" with abstract reporting. The reports are printed on Impact colored paper using Impact color related ink. For this first issue we are using maroon ink on coral paper. Research conducted by Faber Birren, a color authority, and by ophthalmologists and reading psychologists indicates that some color combinations may, more than black on white, "increase reader interest," "stimulate more reading," and "provide restful vision and reading comfort." We shall be interested in reader reaction.*

—THE EDITORS

The First of the Title VII Reports —A Review

KENNETH D. NORBERG

Dr. Norberg writes from long association with Title VII, having served as coordinator of the Educational Media Branch (on leave from Sacramento State College) in 1958-59 before Dr. Stone was named permanent head. Similarly Dr. Norberg has been closely affiliated with AV COMMUNICATION REVIEW. *He has been a member of the editorial board since the journal's founding in 1953 and departmental editor since 1954. At Sacramento State he is professor of education and coordinator of audiovisual services.*

TITLE VII OF THE NATIONAL DEFENSE EDUCATION ACT of 1958 provided for the allocation of Federal funds to support research in the use of the new media in education and for dissemination of research findings and other related information. The occasion for this review, the first of a series which will appear in this journal, is the appearance of the first 16 completed reports on research projects supported by the Title VII program. The abstracts which follow this introductory review give the titles and brief summaries of each of the 16 studies. The purpose of this essay is to consider these 16 projects and to note their significance within the framework of the total research program they represent.

About three years have passed since the U. S. Office of Education first undertook the administration of the Title VII program. Many of the earlier research projects are completed and the reports are coming in. In order to gain a perspective for examination of this research, it should be helpful to look at the Title VII program as a whole. As of March, 1961, some 137 research projects were in progress or completed, including the studies which are reviewed here. By media, these were distributed as in Table 1.

TABLE 1—TITLE VII RESEARCH PROJECTS AS RELATED TO MEDIA

Media	*Number*
Non-projected visual materials	11
Still projected materials	27
Motion pictures	42
Audio recordings	31
Live audio materials	4
Television	53
Video tape recording	11
Teaching machines	28
Other	4
Total	137

The distribution by media will be discussed briefly at a later point.

Another way to look at the research is in regard to the level of instruction. Here, the projects were distributed as shown in Table 2.

TABLE 2—TITLE VII RESEARCH PROJECTS AS RELATED TO INSTRUCTIONAL LEVELS

Instructional Levels	*Number*
Kindergarten - Grade 2	10
Grades 3 - 4	10
Grades 5 - 6	21
Grades 7 - 9	18
Grades 10 - 12	23
College	48
Graduate School	9
Multi-level instruction	11
Other	27
Unspecified	9
Total	137

Still another way to analyze the research is to classify studies in terms of their approach or type of problem orientation: Using this system, the research staff of the Title VII program classified 137 research projects as shown in Table 3.

TABLE 3—TITLE VII RESEARCH PROJECTS BY TYPE OF PROBLEM ORIENTATION

Type of Problem Orientation	*Number*
Comparative effectiveness studies	42
Developmental studies	46
Utilization and production studies	36
Research on communication processes and research methodology	13
Total	137

A brief discussion of these "problem orientation" categories should help to characterize the Title VII program as a whole.

Comparative effectiveness studies include such titles as "Are television techniques more effective than conventional methods in teaching the health sciences?" or "Do students retain more from a filmed chemistry or physics class than they do from conventional instruction?" In such studies the purpose, obviously, is to make a direct comparison between experimental and control groups to determine the relative effectiveness of some instructional medium, method, or procedure, as compared to another.

Listed under *developmental studies* are titles such as "Can televised reading instruction improve reading programs and gain parents' support for new instructional approaches?" or "Will faculty participation in planning and preparing audiovisual materials overcome use barriers?" or "Are motion pictures applicable to educational testing?" In these studies the effort is obviously to determine whether or not some educational objective can be realized, or how effectively it can be realized, by some experimental means. This does not mean that the comparison technique drops out completely (since experimental studies almost inevitably involve comparisons) but rather that the effectiveness of the instructional medium or method under study is established (or not) on some basis other than a direct comparison with another (say "conventional") method. The term "developmental studies" also seems to imply that the aims of the researcher are rather closely linked to the practical implementation of innovations in an on-going program of instruction. Needless to say, this kind of relationship between practical and experimental interests is not without its disadvantages and controversial aspects. Research is never quite so pure, action never quite so positive, when one is joined with the other. Nevertheless, it is difficult to see how significant instructional research can be carried on without orientation to programmatic development in the schools.

In media research one would expect to encounter rather frequently studies having to do with *utilization and production*. Typical projects in this category include "What are the most effective ways to utilize television in the teaching of elementary science?" or "How can filmstrips be made more effective for teaching information?" or "What factors relate to the effectiveness of a teaching machine program?" or "What factors within pictorial illustrations lead to increased learning?"

The fourth category, *research in communication processes and research methodology*, includes only 13 items. Here are such titles as

"Would a non-linear presentation of images improve learning from films?" or "What are the behavioral processes involved in self-instructional procedures?" or "What effect does screen size, image size, and image contrast have on perception as measured by reaction time?" This category includes studies reflecting a somewhat more basic approach to problems of communication in the context of the instructional process. The projects in this group are less related to rather specific instructional techniques—more concerned with theory and the development of principles having broad application to the communication processes in education.

Further analysis of the 137 projects reveals a wide spread of learning goals and subject content areas. While 67 of the studies were concerned with information gain, 53 gave attention to development of concepts, and 41 dealt with affective outcomes. Many of the studies were concerned with more than one type of learning outcome. The common criticism that television and other media studies have been preoccupied with the criterion of information gain apparently does not apply to many of the Title VII studies. Those who are interested in the distribution of instructional research efforts in various subject-matter areas of the curriculum will find that the Title VII research has penetrated every major content area. The physical sciences, mathematics, and foreign languages are well represented but not at the expense of the social sciences and the humanities. Table 4 speaks for itself:

TABLE 4—TITLE VII RESEARCH IN TERMS OF SUBJECT CONTENT AREAS

Subject Content Areas	*Number*
Social and behavioral sciences	38
Biological sciences	26
Physical sciences	25
Language arts	18
Mathematics	17
Foreign languages	13
Humanities	9
Counseling and guidance	6
Vocational and practical arts	4
Fine arts	1
Other	15

Most of the 137 research projects were instituted and conducted by educational agencies, and of these the great preponderance (115) were colleges and universities. (Rather strangely, no junior college was represented.) Six studies were conducted by schools or school systems and three by state departments of education. The remaining

few projects were in the hands of various non-profit agencies such as professional associations.

The 16 studies comprising the focal point of this review are rather difficult to describe in general terms because they were selected entirely on the basis of their chronological dates of completion and thus have no particular categorical significance. By media, level of instruction, and approach, they are widely distributed. Six of the projects deal with television, five with combinations of media, and the others with a variety including film, telephone, teaching machines, and tape recordings. Levels of instruction begin at pre-school and extend through college. From the standpoint of approach the heaviest emphasis is upon *comparative effectiveness* (6), followed by *developmental* (5), and *utilization and production* (4). It is not surprising to find that 13 of the 16 studies were conducted by institutions of higher education.

In terms of methodology, most of these projects are experimental studies involving comparisons of test scores or other measures; most of them use statistical devices to determine the significance of differences between the scores of experimental and control groups. Two projects involve survey and other "non-experimental" techniques. (For more specific information on content and method, see the abstracts which follow.)

Having read the 16 reports, this reviewer was impressed by the scope of the research and by the involvement of skilled and perceptive investigators in the study of a variety of instructional problems related to the use of the new media. The quality of the research varies with respect to soundness of design and adequacy of experimental procedures, as one would expect in any large and new program where funds have been administered on the basis of grants; but for the most part the studies reflect great care in screening, evaluation of applications, and guidance given by the Advisory Committee.

There are, however, some questions which might arise in the minds of persons who read these research reports (and those to follow): Why are there so many projects on television? Are the other media being neglected? To what extent, if any, does all this research represent some over-all plan or program? Is the research becoming repetitive or redundant? How much of this is really sound research and how much is merely instructional program development with an experi-

mental orientation? How can further research studies be made progressively better in design?

The rather heavy concentration of research on television applies to the Title VII program as a whole. However, the other media are not being neglected, as Table 4 shows. There have been 42 studies on motion pictures, for instance, as compared with 53 on television. The number of television studies is certainly not disproportionate to the applications for grants in that area. Television just happens to represent an area of especially active concern and development in the past several years. Even so, there has been some shifting of emphasis, even within the short time-span of the Title VII program to date. Especially noteworthy is the number of studies concerned with teaching machines and programmed materials (28), representing a very substantial amount of activity in this new field.

The question of the relative amount of attention given to any particular aspect of the total field of media research suggests the possible need of an over-all plan. If public funds are to be used for instructional research, is it advisable to proceed with programmatic objectives in view? Members of the U. S. Office of Education staff, the Advisory Committee, and consultants considered this question at some length when policies and procedures were being developed in the early months of the program. The position that developed at that time was that a Federal agency should not be in the position of "master-minding" educational media research in the schools and colleges. The need of some measure of direction was recognized. However, it was decided that inclusive plans and directions for research should be developed on a "grass roots" basis. In other words, the U. S. Office of Education would seek to promote analysis of research needs and planning but would not attempt to take over this function as an internal activity of the Title VII program. Under the provisions of Part B of Title VII, regional conferences and seminars have been implemented with such planning purposes in mind, and the results of these meetings are now available to prospective researchers. More will be said about this later.

The criticism that certain kinds of hypotheses are being tested over and over again, far beyond the point of justifiable replication, has been applied to a great deal of television research and especially to the many studies of "comparative effectiveness." Looking at the program as a whole, some of the Title VII research does seem to reveal this tendency to do it "over and over again." For instance, seven projects are con-

cerned with the comparative effectiveness of television and conventional instruction. However, if these studies are examined closely, one finds that each one is actually a different problem. Five of the seven are set up to make the comparison in various subject-matter fields which range from speech to operative dentistry; two of the studies deal with variations of conditions other than subject matter. It appears that researchers and practitioners are frequently reluctant to generalize the findings of comparative effectiveness studies from one subject-matter area to another or from one set of conditions to another, and the reluctance seems justified, at least under present conditions.

No doubt the force of the criticism of redundancy in television research arises from the sheer number of studies and the monotony of the ubiquitous finding, "no significant difference." From the sheer quantitative weight of such evidence it is argued that there can be no doubt of the fact that "television can teach." I would agree. The fact is there. It has been "proved." The problem is not the validity of the proof, but the significance of the fact. It is important, of course, to know that television, or any other medium, can be used for instruction. But the knowledge of this potential immediately poses many other important questions. It is not enough to know that television can teach, that films can teach, that teaching machines can teach. The *real problem is how and what each device can do best for what kinds of students, under what conditions, with respect to what educational objectives, and in relationship to other devices and to the human resource, the teacher.*

If we knew more about the nature of the learning process as related to various characteristics of subject-matter content being taught, and with respect to various instructional objectives, it would be much easier to generalize research findings from one instructional situation to another. But lacking a more sophisticated level of theory, true efficiency in research efforts is difficult to achieve. The present common research practice of trying the new medium or the new practice first in one subject-matter area and then another, is justified, perhaps, on the grounds that our present theoretical base doesn't seem to provide for better alternatives.

Developmental interests join forces with researchers whose statistical tools, although not always the best, are often better than the available theoretical models with which they work. There is a feeling of urgency —a powerful impetus to put the modern technology of communication to work to compensate for shortages in education, and to improve the

quality of the instructional output. Under these conditions we are frequently inclined to settle for research that tells us whether or not a medium or method will "work" in a given situation, even though we know the yield in terms of principles or generalizations will be meager. A research effort such as the Title VII program needs time to grow and put down roots. The pressure to support developmental research will continue, and this represents a legitimate use of public funds, within limits. (It should be noted that a large share of the Title VII research to date has a developmental character, and this quality is not limited to those studies which are designated as "developmental" by the formal classification already described.) However, there is a critical need to develop a strong theoretical base in order to make the research more productive and to help build the foundations of a science of instructional technology.

Fortunately, the Title VII staff and the Advisory Committee are aware of this need and have taken positive steps to do something about it. A conspicuous example of this interest was the symposium on "New Teaching Aids" held at Stanford University in November 1959. The report of this seminar includes papers by Ralph W. Tyler, Roy M. Hall, William E. Spaulding, Ernest R. Hilgard, John W. Riley, Jr., Wilbur Schramm, C. R. Carpenter, Charles F. Hoban, J. H. Kanner, and A. A. Lumsdaine. These reports deal with the state of research in television and tutorial machines viewed against a background of social and educational trends and with reference to current learning theory. Here is precisely the caliber and the kind of leadership which is required to develop a theoretical base for new media research. No investigator or prospective researcher in this field could read (for instance) the comments of C. R. Carpenter and Charles Hoban on the meaning of a systems approach to the use of the media in education without some effect on his subsequent work. This single concept, properly elaborated and developed and properly related to an adequate theory of learning, could produce very important changes in educational media research, and yet how few of the research studies to date reflect an awareness of this idea or any concern for its implications.

Research in any area can only be as good as the questions that are asked. Good questions require well developed theory. A good deal of promising work has been done and is being done in the field of communication theory. More needs to be done. Learning theory needs to be taken out of the laboratory and related to instructional

and communication processes. More work of this sort has begun to appear[1]. Such concepts as the notion of "instructional communication-systems engineering"[2] and the systems approach to instruction need to be cultivated and related to the other elements out of which a proper theoretical base for instructional media research can be constructed.

Admittedly, the development of usable theoretical models of processes involved in the very complex instructional situation is an extremely difficult, not to say hazardous, task. A new field such as this needs freshness of insight, and some bold creative gusto is a good sign. But this must be balanced by the constant demand for clarity of expression (in theoretical statements), by adequate explanation and documentation of broad generalities, by accountability to the established disciplines contributing to the field, and by the never-ending patience of sober investigation.

Finally, the rapid growth of a body of research information concerning the instructional process signals the need of a system for storage, retrieval, and distribution of this information to practitioners and other researchers. This need, which has been a matter of concern to the Title VII program from the start, was made the subject of an important study conducted by Maurice F. Tauber and Oliver L. Lilley of the School of Library Service at Columbia University. The report of this study, which was conducted under the provisions of Part B of Title VII, has been completed and is included among those covered by this review. The title, *Feasibility Study Regarding the Establishment of an Educational Media Research Information Service,* suggests the fact that the U. S. Office of Education is interested in setting up such a service, or system, although not necessarily as an internal operation.

The recommendation growing out of the study is that an information service on educational media research be established in the U. S. Office of Education under the Media Branch. In addition to a general analysis of the need for, and functions to be served by, such a service, the report deals with the matter of bibliographical identification of media research studies, and provides a rather extensive "exploratory classification schedule for research in educational media and communication."

[1] The next supplement of *AV Communication Review,* to be edited by Wesley C. Meierhenry, will be devoted in its entirety to the subject of "learning theory and audiovisual education." Also note the new book by O. Hobart Mowrer on *Learning Theory and the Symbolic Processes,* published by John Wiley & Sons, 1960.

[2] See Henry Bern's discussion of this subject in "New Directions in Audio-Visual Communications," Indiana University Bulletin of the School of Education; November 1960.

The authors of this study, and their consultants, believe that prompt feedback of information regarding research completed, and in progress, is necessary not only to help researchers and practitioners keep abreast of the field and to prevent needless duplication of experimental investigations, but also to provide a necessary condition for coordination of research efforts and systematic development of principles growing out of lines of inquiry having continuity. A research information service cannot provide coordination or insure continuity of research by itself, but it is an indispensable tool for those who are concerned with these problems.

TITLE VII RESEARCH ABSTRACTS INSTALLMENT I

Burkhart, James A.

An Experiment To Determine the Values of Using Amplified Classroom Telephone Interviews with Significant Individuals To Enrich Certain College Courses. Columbia, Missouri: Stephens College; September 1960. 44 p. (USOE Project No. 250; University Microfilms Pub. No. 61-3612)

Purpose: To determine whether amplified-telephone interviews with significant people could enrich college courses.

Procedure: Method. One section from each of four college courses taught by "regular methods" (American Government, Principles and Problems in Modern Business, Basic Beliefs, and Masterpieces of World Literature), was supplemented by the addition of a bi-weekly telephone interview with some significant national figure or eminent authority. These interviews were amplified for listening by the entire class. Students were usually encouraged to do supplementary reading to broaden their understanding of the subject. Two interview procedures were used: (1) After brief preliminaries by the instructor, students conducted the main interview; or (2) The instructor conducted most of the interview with student questions occupying a shorter length of time. The control section in each course was conducted in the same manner with the exception of the interviews.

Statistics. Results were analyzed by chi-square.

Subjects. The subjects were lower division college women. In the American Government experimental group 29 students took the attitude pre-test and 19 the post-test; 28 took the knowledge pre-test and 19 the post-test. The control group had 26 in the attitude pre-test and 15 in the post-test; 26 in the knowledge pre-test and 16 in the post-test. No numbers were reported for the other three courses.

Test Measures. (1) A "knowledge test" over the content was "devised by the instructors to evaluate content competency." No information on its design or validation is presented. (2) The American Council on Education *Inventory of Beliefs* test was used to determine student attitudes. (3) A series of informal interviews with students was conducted to determine student responses to the telephone interview technique. (4) Each instructor completed a teacher evaluation form for each interview. In the American Government course, both the knowledge test and the attitude measure were administered in the Fall of 1959 as a pre-test, and again in May 1960 as a post-test. Only the post-tests were administered in the Masterpieces of World Literature and the Introduction to Business courses. No indication of any

testing is included for the Basic Beliefs course. The author states that the teachers ". . . were not provided adequate time to develop instruments nor methods for obtaining test information. In view of this, the testing was somewhat less than satisfactory."

Results and Conclusions: (1) In the American Government course, the interview group made significantly higher scores with respect to the acquisition of knowledge than did the control group. (2) On the basis of only the knowledge post-test scores, no significant differences were found between the two groups in the Masterpieces of World Literature course. (3) No significant differences were found between the experimental and control groups with respect to the *Inventory of Beliefs* test. (4) No test results were presented for the Basic Beliefs course nor for the "knowledge" test in the Introduction to Business course. (5) Student reaction to the telephone interview technique was highly favorable. (6) In general, the four teachers were pleased with their experiences in using the amplified classroom telephone as a teaching resource, but felt that it required more careful preparation, more personal involvement, considerable additional administrative work, and greater skill in execution than was normally the case. —*W. H. Allen*

Carter, Lamore J.; Moss, Roy B.; and Wilson, Mamie T.

A Comparative Study of the Effectiveness of Three Techniques of Film Utilization in Teaching a Selected Group of Educable Mentally Retarded Children Enrolled in Public Schools in Louisiana. Grambling: Grambling College of Louisiana; August 1960. 76 p. (USOE Project No. 272; University Microfilms Pub. No. 61-3620)

Purpose: To determine the effectiveness of three experimental film techniques (varying in regard to learner participation required) and a conventional teaching method in the instruction of educable mental retardates.

Procedure: Method. Seven short films of children involved in learning a study unit entitled "Health and Safety" were produced with these three different sound tracks: (1) narration in the form of a recorded voice synchronized with film action and pointing up facts, principles, and behavioral changes for the pupils to learn; (2) unnarrated, but with recorded voices of children synchronized with the action; and (3) unnarrated and with no recorded sound, but in which the pupils were taught to attempt to direct the actions of persons and situations in the film by loud, frequent, unrestrained verbalizations of approval, warning, sympathy, ridicule, etc. A control group was taught the same information in the conventional manner without film. Each film was shown two days consecutively over a three-week period. The experimental design utilized the pre-test, post-test method.

Subjects: The experimental group consisted of 104 pupils from 20 special classes of educable mentally-retarded children in public schools. The mental age of 65 months was selected as the separation between "high-grade" and "low-grade" mental retardates. Attempts were made to equalize the groups by quality of teaching and school and classroom facilities.

Statistics: Analysis of covariance was used for testing the differences between groups.

Test Measures. The effectiveness of the instructional methods was measured by differences between learning scores on pre-test and post-test forms of *A Picture Test on Health and Safety* designed by the principal investigators. This was a non-verbal recognition test designed to assess health and safety information and administered by using 40 sets of four camera snapshots, each depicting "good" and "poor" health and safety practices among children.

Results and Conclusions: There were no differences in the achievement of the educable retardates in health and safety—whether they were taught by one of the three experimental film techniques or by the regular classroom procedure. Neither did mental age status influence the achievement of facts and principles by any one of the four methods. The investigators attribute failure of predicted superiority for the film technique that required overt audience participation to the fact that, among retardates, "a given pupil was impeded in gaining new insight by the competing tendency to notice other pupils and what they sensed and were responding to." —*W. H. Allen*

Chance, Clayton W.

Experimentation in the Adaptation of the Overhead Projector Utilizing 200 Transparencies and 800 Overlays in Teaching Engineering Descriptive Geometry Curricula. Austin: The University of Texas; August 1960. 49 p. (USOE Project No. 243; University Microfilm Pub. No. 61-3610)

Purpose: To compare the instructional effectiveness of university engineering drawing classes taught by projected overhead transparencies with those taught by the use of the chalkboard.

Procedure: Method. A semester course in engineering drawing was taught to four randomly organized classes of university students by two instructors using the following methods: (1) projected overhead color transparencies specially prepared for the course under the supervision of the project director, and (2) chalkboard drawings rendered on the chalkboard by the instructor. Each instructor taught one transparency class and one chalkboard class.

Statistics: Analysis of variance was employed for testing the differences in achievement between the two media groups.

Subjects. The experimental sample comprised 104 second-semester freshman engineering students at the University of Texas. They were assigned to four separate classes on the basis of a student questionnaire and the *Space Relations 30-minute Differential Aptitude Test.*

Test Measures: The *Space Relations* test was administered both as a pre- and post-test. Student achievement was determined on the basis of their 107 daily drawings, five quizzes, and the final examination.

Results and Conclusions: (1) It was determined that approximately 15 minutes per 60-minute class lecture could be saved by the transparency media over a comparable blackboard lecture. (2) Although there were no significant differences between the two groups in the daily drawing grades and the five quiz grades, there was a consistent superiority in favor of the transparency group. (3) The final examination grade and the final course grade for the

transparency group were significantly superior to the chalkboard group. Of the total number of students that made an "A" in the course, 64 percent were in the transparency group; of the total number that made an "F" in the course, 75 percent were in the blackboard group. (4) Of the total number of questions asked in the lectures, 70 percent were in the transparency group, which signified a greater degree of pupil attentiveness. (5) Both instructors and the project director favored the transparency method of teaching over the chalkboard method. (6) When opinions of the students were taken into account, the transparency medium received their unanimous approval.

—W. H. Allen

Creore, A. E., and Hanzeli, Victor E.

A Comparative Evaluation of Two Modern Methods for Teaching a Spoken Language. Seattle: Department of Romance Languages and Literature, University of Washington; September 1960. 77 p. (USOE Project No. 108; University Microfilms Pub. No. 61-3622)

Purpose: To compare the effectiveness of an "audiovisual" method with a "conventional" method of teaching basic college conversational French.

Procedure: Method. The "audiovisual" method was based on the Borglum, Salvan, and Mueller text, *Images de France: An Audio-Visual Course in Beginning French,* and consisted of a set of 35mm color slides integrated with the text lessons, a Teacher's Guide, a pre-recorded magnetic tape for each lesson which students listened to in the language laboratory, and several supplementary textual materials. The "conventional" method used the Harris and Lévèque text, *Basic Conversational French,* supplemented by readers, a set of integrated pre-recorded tapes for use in the language laboratory, and nine locally-recorded tapes. With the audiovisual method, the slides were used to introduce each lesson, then again for pattern drill, and finally, during another period, for review. Four 20- to 25-minute laboratory periods were scheduled per week. With the conventional method, the audio-lingual approach was emphasized as extensively as with the experimental method, but dialogues were used instead of the visual slide material, and some of the exercises included translation. The control students attended the language laboratory for the same amount of time as the audiovisual group. It was impossible to rotate the faculty between the experimental and control groups.

Statistics: The data were analyzed using standard statistical measures, including correlation methods, analysis of variance, and *t* tests.

Subjects: The subjects were drawn from freshman university classes at the beginning and end of the second quarter (of three quarters) of instruction. Students were enrolled without previous knowledge of the method to be used in any particular section. The major conclusions were based primarily on 55 students in the audiovisual group and 40 control students. The two groups showed no significant differences on any of the co-variates selected to analyze their homogeneity.

Testing Measures. Students were tested at the beginning and end of the second quarter for (1) skill in understanding spoken French, (2) speaking

ability, and (3) achievement in writing and reading. Questionnaire surveys were conducted to determine student attitudes, appreciations, and motivations. Teacher attitudes were measured by a questionnaire administered to about 75 teachers familiar with *Images de France* throughout the country.

Results and Conclusions: (1) The greatest advantage for the experimental audiovisual method was its efficiency in teaching the *speaking* skill, the scores of 55.5 to 42.4 being strongly significant. (2) In the *reading* skill, however, the experimental method was significantly inferior, 19.3 to 23.6. This inferiority also existed in comparison with national objective test standards. (3) In the *writing* skill, the experimental method was likewise significantly inferior, 45.5 to 55.6, the inferiority also existing in comparison with national objective test standards. (4) Significantly less "transfer" from English to French seems to have taken place in the audiovisual group than in the control group, students' knowledge of English playing a slighter role in their acquisition of French by the experimental group. (5) There was no apparent relationships between achievement and rating of instruction, student prediction of their own achievement or their evaluation of the course, language laboratory, and the importance of foreign language skills. (6) The audiovisual approach showed a consistent, but non-significant, motivational effect in the tendency to continue the study of French. (7) The general conclusion was that the college teacher who tries to achieve a balanced progress in all four language skills during the first year of study would find the audiovisual method (as organized in this study) inferior to the conventional method.

—*W. H. Allen*

Durost, Walter N.

"When Is September?" An Experiment in the Provision of Pre-School Experiences via Educational Television To Orient and Motivate Children Entering Grade One and To Facilitate Their Adjustment to Group Activities. Clearwater, Florida: Pinellas County Board of Public Instruction, 1960. 136 p. (USOE Project No. 120; University Microfilms Pub. No. 61-3618)

Purpose: To study the effectiveness of a series of pre-recorded and live TV programs in orienting pre-school children to the first grade by acquainting them with the school environment, developing proficiency in certain basic skills, and orienting parents to their expectancies and responsibilities.

Procedure: Method. Twenty one-hour telecasts were presented over an educational television station during the month prior to the opening of the school year. The first half-hour of each program was a film designed for both child- and parent-viewing. The second half, for parents alone, was live. Evaluation of program effectiveness was made by parent and teacher questionnaires, parent interviews, and by comparing achievement of participants and non-participants.

Subjects. Major analysis of the program effectiveness was made with a group of 42 children and parents who had viewed at least half of the programs. The children in this group were matched as closely as possible with a control group of non-TV participants on the basis of race, sex, school, age, and socio-economic status.

Statistics. Critical ratios on the three standardized tests were determined for all first-grade children in the county versus the control group, first-grade children versus the experimental group, and the experimental versus the control group.

Test Measures. School learning capacity measures used were the *Metropolitan Readiness Test* and the *Pintner-Cunningham General Ability Test.* The achievement criterion measure was the *Metropolitan Achievement Test, Primary I Battery.* Questionnaire surveys were made of parent and teacher behavior and reactions to the programs. Mothers of children who had viewed at least half of the programs were interviewed.

Results and Conclusions: (1) Although the author expresses his reservation about the randomness of the samples used to evaluate the effectiveness of the telecasts, he points out that "the consistency of the differences argue for the assumption that the television experience has had a real effect on improving the test performance of the experimental group as compared to the control group." (2) The first-grade teachers felt that the television programs had a positive effect upon the viewers. (3) Parent reaction to the programs was generally favorable.

—W. H. Allen

Ferster, C. B.

The Role of Review Material in Continuous Programming with Teaching Machines. Indianapolis: Indiana University Medical School; December 1960. 3 p. (USOE Project No. 355; University Microfilms Pub. No. 61-3611)

Purpose: To determine whether repetition of the program material in the self-instructional devices contributed to the mastery of the material.

Procedure: Method. The 61 lessons of the first revision of the Holland-Skinner psychology course were presented to the students in semi-automatic teaching machines kept on a reserve basis in the Medical School Library. The students could use the machines in the library or take them home. Lessons 22 and 37 of the program were test lessons designed to test the mastery of the materials immediately preceding. These tests were given in the library under controlled conditions, unlike the remainder of the materials which could be completed anywhere. When a lesson was to be repeated, a second copy was pasted on at the end so that the student repeated the lesson simply by continuing to operate the machine. Half of the students studied Lessons 1 to 22 with only a single repetition, and half without repetition. The conditions were then reversed for Lessons 23 to 36 and again between Lessons 38 and 60.

Subjects. The subjects were 49 students in the author's section of the freshman psychiatry course at Indiana University.

Statistics. The *t*-test was used to determine statistical significance.

Test Measures. The 60-minute final examination consisted of 86 items taken from the teaching tapes. The questions were presented in irregular order and selected so as to cover the content of the course. The students were given assurance that they would not be graded on the teaching-machine results, only on the final examination.

Results and Conclusions: "The results of these experiments give no evidence that simple repetition of the teaching lessons aided in their mastery. The tests given after a series of repeated teaching machine lessons showed no higher level of performance than those given after a series of unrepeated lessons. Students reported that they could essentially memorize the answers when they took the lessons the first time, and that the repetition did not constitute as much of a review as it might have, had the material been different. Undoubtedly, a much better form of repetition is the kind already built into the teaching lessons, in which the student is given review of the basic concepts by a variety of examples which test the relevant concepts." —*W. H. Allen*

Frazier, Alexander, and Evans, Lewis D.

Testing the Effectiveness of Two-Purpose Television Programs in Contributing to Both Teacher and Pupil Learning (Elementary Science). Columbus: Center for School Experimentation, University Schools, Ohio State University; December 1960. 79 p. (USOE Project No. 298; University Microfilms Pub. No. 61-3623)

Purpose: To explore the effectiveness of two-purpose television programs in contributing to increased teacher understanding of elementary science and in stimulating pupil activity in this field.

Procedure: Method. Ten half-hour telecasts were prepared on elementary science topics approved by 151 teachers of third- and fourth-grade classes. These telecasts were sent to classrooms at two-week intervals. Effects of the telecasts were evaluated in a variety of ways in order to determine their value in affecting teacher and pupil behavior.

Subjects. Participating in the study were 151 teachers and 4814 third- and fourth-grade pupils. The group comprised volunteers from all of the third- and fourth-grade teachers in Columbus and the adjoining county schools. This group attended an orientation session at University School prior to the series, at which time they were administered an attitude measure, saw a sample kinescope, were told the purposes of the study, and received copies of the study guide and evaluation instrument.

Statistics. Results were evaluated by means of rating scales and questionnaires.

Test Measures. Six measures were used: (1) an attitude questionnaire given to teachers before the project started and again at the close; (2) *Sequential Tests of Education Progress* (Cooperative Testing Service) given to fourth-graders to measure aspects of thinking and the ability to use science information in situational problems; (3) individual program evaluations by teachers; (4) final teacher evaluation of the series as a whole; (5) principal and supervisor reactions; and (6) personal interviews with 20 teachers selected at random.

Results and Conclusions: (1) Teachers significantly increased their feeling of competence in handling science in the elementary classroom, the greatest increase being in the physical sciences area. (2) Teachers professed a willingness to accept similar consultant service in other areas as well as in elementary science; there was no overt expression of resistance to the idea of being educated along with their children. (3) Teachers evaluated all the programs as high in pupil

interest and reported that they observed significant growth in problem-solving behavior. They also reported increased home interest in science activities, more materials brought to class, and increased breadth and range of questions asked by children. (4) Fourth-grade pupil growth in achievement over the period of the study as measured by the STEP test was not significant.

—W. H. Allen

Garry, Ralph J.

Report of Research on the Integration of Science Teaching by Television into the Elementary School Program. Boston, Massachusetts: Boston University; October 1960. 79 p. (USOE Project No. 031; University Microfilms Pub. No. 61-3616)

Purpose: To study the effects of teacher training, method of presentation, teaching method, and pupil activity upon the achievement, interests, attitudes, and scientific reasoning ability of fifth-grade pupils studying natural science by television.

Procedure: Method. Ninety classes of fifth-graders viewed a series of 30 half-hour natural science programs produced by the Massachusetts Audubon Society and designed to develop understanding of the relationship of all living things to their environment. Eighteen control classes received the televised instruction with no additional related instruction. The 72 experimental classes received televised instruction under the following combination of conditions: (1) TV instruction to initiate a unit of study versus TV instruction to terminate the unit; (2) teacher use of an extensive study guide versus no study guide; (3) presentation of common assignments to all class members versus encouragement of pupils to work on individual projects; (4) teachers with workshop training (30 hours) in science versus teachers with workshop training in the utilization of TV versus teachers with no special training in conjunction with the study. Thus, three experimental classes were operating under each combination of each of the four experimental conditions. Classes were randomly assigned to experimental treatment. Testing was before midyear and after the treatment.

Subjects. About 2600 fifth-graders in 90 classes randomly drawn from 300 fifth-grade classes in 30 cooperating communities of urban, suburban, and semi-rural composition within a 50-mile radius of Boston.

Statistics. Analysis of variance was used in treatment of the data, using classes as subjects. Hence N = 90.

Test Measures. Measurement of effects was made by specially-constructed tests on science information, science vocabulary, standardized science achievement, science reasoning, interest inventory, activity check list, TV viewing check list, and two attitude scales.

Results and Conclusions: (1) Large, statistically significant differences were obtained in favor of the experimental classes over the control classes in science information and vocabulary achievement. (2) No significant differences were found between the experimental and control groups in scientific reasoning ability or interest in science. (3) None of the main experimental effects taken singly produced statistically significant differences between classes within the

experimental group, but significant differences on certain interactions were obtained. (4) Teacher training in a specific subject would have to be more intensive than that provided in workshops established for this study in order for it to produce significant differences in pupil achievement. (5) If TV programs are to be used as a terminal activity, greater learning occurs where the class assignments are made by the teacher and are comomn to all; where TV is used to initiate a program, the follow-up activity for an optimum combination is individual projects or assignments. (6) Teachers with a brief outline and suggestions for pupil projects achieved as much with their classes as teachers with a comprehensive study guide. (7) Pupil attitudes toward science and toward scientists do not change readily. (8) Children of high initial interest and children of high intelligence tended to lose interest as the school year progressed; the more intensive the school work, the greater the loss. Two explanations were advanced for this finding: one is that the initial high interest was not based on reality and that direct experience produced a more realistic experience measure in most children; the other explanation is that when an established interest exists, making it a phase of school work tends to kill it. (9) Variations in skill among teachers yielded considerable differences in learning, suggesting that the quality of teaching is primary rather than the amount of time given to science. (10) The concluding suggestion is made that "while we may be effective in providing for conventional academic achievement, we have much to learn about creating an educational climate which provides for specific changes in interest, attitude, and reasoning."—*W. H. Allen*

Ivey, Sara M., and DeMarco, Norman

A Study of Closed-Circuit Television as a Teaching Technique for Speech Improvement in the Public School System. Fayetteville: Department of Speech and Dramatic Art, University of Arkansas; January 1961. 83 p. (USOE Project No. 278; University Microfilms Pub. No. 61-3621)

Purpose: To test the effectiveness of closed-circuit TV instruction as inservice training for elementary classroom teachers and to test the amount of speech improvement achieved with third-grade children through 52 closed-circuit TV programs presented for one year.

Procedure: Method. A year-long series of 52 closed-circuit telecasts on training in the fundamental oral communication skills was presented to the experimental group. Each telecast, 20 minutes in length and presented twice weekly, was designed to create an awareness of the importance of speech and to provide specific training in vocal, articulatory, and listening skills. A matched control group received no training in speech improvement. The experimental design utilized the pre-test, post-test method. The telecasts, specially prepared for the experiment, made use of puppets, audiovisual materials, and dramatization.

Subjects. Ten classes consisting of 220 third-grade children served as subjects, one experimental and one control class in each of five schools. A table of random numbers was used to equalize the class sizes in each school.

Statistics. Analysis of covariance was used for testing the differences between the groups. When the covariance analysis showed a significant difference among

schools or groups, a *t* test was used to determine where these significant differences were.

Test Measures. A battery of 11 tests was used to evaluate the processes involved in: using speech sounds, discriminating among speech sounds, listening, recalling, reading, language comprehension, intelligence, and personality of the talker. Tapes were made of each child's articulation, reading, and spontaneous speech.

Results and Conclusions: Although both experimental and control groups improved in speech performance during the year, improvement by the television group was not significantly superior to that of the control group. The findings seem to indicate that closed-circuit TV, as presented in this study, was not an effective medium for improving the speech of third-grade pupils. Nor was TV instruction effective as inservice training for elementary classroom teachers.

—*W. H. Allen*

McBeath, Ronald J.

A Comparative Study of the Effectiveness of the Filmstrip, Sound Filmstrip, and Filmograph for Teaching Facts and Concepts. Los Angeles: Department of Audio-Visual Education, University of Southern California; February 1961. 26 p. (USOE Project No. 462; University Microfilms Pub. No. 61-3615)

Purpose: To compare the relative effectiveness of four filmic media in presenting facts and concepts.

Procedure: Method. A sixth-grade social studies lesson was developed around the subject of the exodus of the Maoris from Polynesia, their sea voyage to New Zealand, and their way of life in New Zealand. The content was produced in four alternate versions: as a silent captioned filmstrip, a captioned filmstrip with recorded narration, a sound filmstrip in which the sound track of the filmograph was duplicated with the addition of an audible tone as a cue to turn to the next frame, and a 16mm sound filmograph. Instructions to the experimental groups were presented as a tape recording. The 30-item pre-test was administered so that pupils sitting beside each other had different forms of the test. Upon completion of the pre-test, the group was shown the appropriate film, followed immediately by the alternate form of the 30-item post-test. Pre- and post-tests were combined into a 60-item retention test administered three weeks later.

Subjects. Twenty sixth-grade classes of 558 pupils were selected from ten different areas of Los Angeles County. Pupils were matched into four groups by classes according to IQ, age, sex, and socio-economic status of the father.

Statistics. Analysis of variance and the Tukey test were employed on the mean gains to test the differences among the groups.

Test Measures. A 60-item test of facts and concepts was prepared. A pilot study with 135 comparable children showed the reliability of the test to be .85 using the Kuder-Richardson formula 20. After an item analysis, the questions were paired into two 30-item forms for subject matter, difficulty, and discrimination.

Results and Conclusions: (1) On the immediate and retention tests, no single method was found to be significantly superior or inferior, although the captioned filmstrip with narration showed a slight superiority to the other versions. (2) The boys did significantly better than the girls on both tests. (3) Students with high intelligence did significantly better on both tests than did those with lower intelligence. (4) On the immediate test, the interaction between sex and methods was statistically significant. The highest gains were scored by boys who saw the captioned filmstrip with narration; the lowest gains by girls who saw the filmograph. —*W. H. Allen*

McLuhan, H. Marshall

Report on Project in Understanding New Media. Urbana, Illinois: National Association of Educational Broadcasters; June 1960. 235 p. (USOE Project No. 179; University Microfilms Pub. No. 61-3619)

Purpose: To "explain [in a syllabus usable in secondary schools] the character of a dozen media, illustrating the dynamic symmetries of their operation on man and society."

Procedure: The author had a number of conferences with educators, communication specialists, management consultants, psychologists, and sociologists in order to gain insight into the problem. Three "media experiments" were reported bearing on the hypotheses set forth in the study. The written report centers upon a number of charts of different communication media, describing each in terms of: Low Definition (wherein a low degree of information is provided for the sense in question, such as in television or the telephone), High Definition (wherein a high degree of information is provided, such as in film or radio), Structural Impact (which refers to the sensory impressions as they affect the beholder or audience), and Subjective Completion (which concerns the effect of this impression as it is processed by the audience). The portion of the report bearing on the print media is supplemented by *Gutenberg Galaxy,* a half-hour film made for that purpose.

Conclusions: Before anybody in the Western world can approach any medium, it is necessary for him to be fully aware of the shaping forms and consequences in the sensuous and mental lives of all who are exposed to the phonetic alphabet, written or printed. *Understanding Media* postulates the basic hypothesis that any means of codification of experience in terms of any sense whatever inevitably transforms the ratio among the other senses and thereby alters patterns of thought, feeling, and action. Once an external means of codification exists, it becomes not only a translator of experience but a means of translating one sense into another. Languages are the first media. They are the lowest in definition of all media, requiring more participation and active "closure" on the part of hearer and speaker alike than any other medium. The concept of closure or completion is basic in understanding media, since it becomes possible to see why no sense can operate in isolation from all the others and no medium can exist by itself. The medium determines the modes of perception and the matrix of assumptions within which objectives are set; that is, "the medium is the message." Not only is the medium the message, but "information" or "content" of any medium is always another medium. It still becomes necessary

to understand any medium in all its levels and manifestations in order to have any critical awareness of "message." Thus the medium of radio may contain the medium of speech or of music, but the effect of radio in stepping up the ear component in the human sense ratio is quite independent of the speech or music "program" factor. Media *qua* media are total systems, but not closed systems. They can be modified by the coexistence of other media. Television appears as a primarily tactile rather than visual medium. All the recommendations can be reduced to this one: "Study the modes of the media, in order to hoick all assumptions out of the subliminal, non-verbal real for scrutiny and for prediction and control of human purposes."

—W. H. Allen and H. M. McLuhan

Paine, Frank R.

Audio-Visual Aids for Student Council Education. Oxford: The University of Mississippi; September 1960. 141 p. (USOE Project No. 375; University Microfilms Pub. No. 61-3614)

Purpose: To discover, through a survey of schools with outstanding student councils, the audiovisual materials which appear most effective in creating and maintaining good student government, their utilization, and the new materials needed.

Procedure: Method. Eighteen high and junior high schools were selected to represent the major sections of the country, sizes and levels of schools, and different socio-economic classifications. Data were gathered by means of interviews with students, student council advisors, teachers, student council officials, and audiovisual specialists. Interviews were tape-recorded.

Subjects. High school and junior high school students and educators involved in student council activities.

Statistics. Summary and analysis of interview data.

Test Measures. Recorded interviews on four standardized forms constructed to elicit information from the following groups: state executive secretaries, audiovisual directors, student council leaders, and student council sponsors.

Results and Conclusions: (1) In the opinions of educators and student leaders interviewed, good audiovisual materials can accelerate, extend, and enrich student council education. (2) The weakest aspect of student council education is the lack of up-to-date high quality audiovisual materials related directly to its present needs. (3) Educators and student leaders expressed their eagerness to receive and make use of effective new films and filmstrips. (4) To fill the need, some student councils made their own amateur films. (5) Existing motion pictures dealing with citizenship education and youth problems were found to be in an extremely low state of utilization. (6) The research staff concluded that the greatest single cause of non-utilization of available films was the fact that they had never been cataloged and evaluated in a publication that related them to the needs of student council education. (7) The investigation produced a catalog, with evaluations, of student-council-related films and filmstrips. (8) Evidence from leading commercial educational film producers indicates that no work is in progress on films for student council education.

(9) The staff formulated a list of 11 films recommended for production. (10) The most serious and frequent criticisms of existing films were: they are too elementary, are written for junior rather than senior high school, show old-fashioned styles, talk down to students, are miscast, and are so unnecessarily dull that modern students resent being required to view them.

—W. H. Allen

Popham, W. James

Tape Recorded Lectures in the College Classroom: An Experimental Appraisal. Department of Education and Psychology, Kansas State College of Pittsburg; August 1960. 15 p. (USOE Project No. 474; University Microfilms Pub. No. 61-3617)

Purpose: To determine the effectiveness of teaching a graduate level college course in education research methods with a series of tape recorded lectures.

Procedure: Method. An eight-week summer session course was taught by two methods: (1) a conventional lecture-discussion approach versus (2) a series of tape recorded lectures coupled with brief discussions led in person by the lecturer. The students enrolled were divided into two groups matched by three pre-test measures. The control group (conventional mode) met from 2:10 to 3 p.m. daily; the experimental group (tape recording mode) started at 2:30 and ended at 3:20 p.m. This permitted the instructor to teach the control section, then meet with the experimental section at the end of the 30-minute tape recording for the 20-minute discussion period. Lectures were taped only several days in advance to insure comparable course content in both sections. In all, 34 taped lectures were heard by the experimental classes. The pre-tests were repeated at the end of the class sessions during a two-day period.

Statistics. The *t*-test was used for testing the differences between the two groups on achievement, and the Mann-Whitney *U*-Test was employed to test differences between the two groups on students' proposed research plans and differences when students were grouped by ability.

Subjects. Subjects were 55 students enrolled during the 1960 summer session course in Educational Research Methods conducted at Kansas State College of Pittsburg. There were 27 students in the experimental group and 28 in the control group. No significant differences existed between the two groups with respect to the three matching test scores, sex, age, graduate credit, teaching experience, or previous academic credit in measurement or statistics.

Test Measures. The acquisition of factual information regarding research techniques was measured by a specially designed 75-item multiple-choice test. The ability to make sound interpretations from reported research was measured by a specially designed 25-item multiple-choice test. Students' ability to plan research studies of their own was measured by giving them a brief description of a problem suitable for research analysis and instructing them to describe a research plan appropriate for investigating the problem. Unsigned opinions of the tape recorded lecture technique were solicited from the students during the final test period. The *Miller Analogies Test* was used to equate the groups by scholastic aptitude.

Results and Conclusions: (1) No significant differences between the two groups

were discerned on the information test, interpretation test, or the two measures combined. (2) No significant differences were observed in the case of the high ability or low ability sub-groups. (3) No significant differences were found between the quality of the research plans prepared by the two groups. (4) In general, student opinions of the taped lecture method were favorable. (5) Many students in the experimental group indicated that the discussion period was extremely important. *—W. H. Allen*

Popham, W. James, and Sadnavitch, Joseph M.

The Effectiveness of Filmed Science Courses in Public Secondary Schools. Department of Education and Psychology, Kansas State College of Pittsburg; August 1960. 63 p. (USOE Project No. 091; University Microfilms Pub. No. 61-3624)

Purpose: To evaluate the filmed physics and chemistry courses in public secondary schools of southeast Kansas.

Procedure: Method. Year-long courses in high school physics and chemistry were taught by two methods: (1) using filmed lessons, produced by Encyclopaedia Britannica Films, in which students viewed approximately one 30-minute film per day supplemented by class discussion, and (2) using the conventional non-film classroom teaching approach. A total of 149 physics and 132 chemistry films were viewed during the academic year. The teachers employing the films participated in a one-day workshop prior to the beginning of school to determine classroom procedures and to arrange the film distribution schedule. Student subject matter achievement, interest in physical science, and attitude toward the subject matter were measured at the beginning of the term and again at the end.

Statistics. Analysis of covariance was employed to test differences between film and non-film groups with respect to subject-matter achievement. Non-parametric tests were used to analyze attitude and interest data.

Subjects. The research sample was drawn from students enrolled in 12 southeast Kansas secondary schools, six schools serving for the filmed physics and non-film chemistry instruction and six schools for the non-film physics and filmed chemistry. Schools in the two groups were matched according to several school characteristic factors. Of the 312 physics students, 155 were taught by film and 157 in the conventional manner; of the 475 chemistry students, 234 were taught by film and 241 conventionally.

Test Measures. The pre- and post-test measures were: *Cooperative Physics Test, Cooperative Chemistry Test, Thurstone Interest Schedule,* and *A Scale for Measuring Attitudes Toward Any School Subject.* Intellectual aptitude was measured by the *Otis Quick-Scoring Mental Ability Test.* Student attitude toward filmed courses in general was measured by a specially-designed *Attitude Toward Film Courses Scale,* and teacher reactions by a specially-designed questionnaire.

Results and Conclusions: (1) The achievement performance of the non-film group in physics was significantly superior to the film group. (2) There were no significant differences between the two groups in chemistry. (3) There was no significant interaction of teaching method with level of student intelligence for

either chemistry or physics. (4) There were no significant differences between the two physics groups in their interest in physical science. (5) The lower ability chemistry film group showed significantly less interest in physical science than the comparable non-film group. (6) Although both groups in physics and chemistry evidenced a more unfavorable attitude toward physics or chemistry as a school subject at the conclusion of the study than they did at the beginning, the film group's attitudes were significantly more unfavorable than those of the non-film group. *—W. H. Allen*

Schwarzwalder, John C.

An Investigation of the Relative Effectiveness of Certain Specific TV Techniques on Learning. St. Paul, Minnesota: KTCA-TV, Twin City Area Educational Television Corporation; September 1960. 50 p. (USOE Project No. 085; University Microfilms Pub. No. 61-3613)

Purpose: To consider techniques in the arrangement and presentation of televised material of fifth-grade science information in order to discover how best to use TV as an instructional tool.

Procedure: Method. Three different techniques of television presentation and use were compared: (1) visual continuity arranged for camera shots in a planned order versus an unplanned random order, (2) visuals reinforced with superimposed materials versus appearance without such "supered" reinforcement, and (3) visuals manipulated by the teacher similar to regular classroom use versus visual manipulation resulting from careful planning by the television team and the teacher. These three techniques were arranged in eight different treatment combinations for the teaching of fifth-grade science lessons on plants, mammals, heat, machines, telegraph, wind, ground water, lenses, and longitude and latitude. Each broadcast kinescope lesson was 25 minutes in length, presented over ETV station KTCA-TV at the rate of one lesson per week per class. The same teacher taught all 72 experimental lessons, the same TV crew was used for production, and the viewing conditions were controlled. The experimental design tested the effects of each of the three techniques and their interactions in a 2x2x2 factorial design.

Statistics. Analysis of variance was used to analyze the data with a .10 level of significance determined to be a reasonable significance level.

Subjects. The experimental groups were 40 fifth-grade classes in the St. Paul Public Schools, selected at random from the 67 available for the study. The order of broadcasting was randomly assigned to these groups.

Test Measures. Tests of about 30 items each were designed for each of the nine lessons after validation on fifth-grade students not participating in the study. Tests were given after each TV lesson. The mental ability of each student was measured by the *Otis Quick-Scoring Mental Ability Test* given at the fourth grade level.

Results and Conclusions: (1) There were 22 differences for the nine science areas found to be statistically significant, all but two of these being at the .05 level. (2) In most instances the highest student achievement resulted from a combination of one technique using the TV team production efforts (planned

continuity or supering or TV visuals) and a second technique using only the teacher's efforts (unplanned camera continuity or no supering or classroom visuals). In other words, the TV production appeared to facilitate the effects of the teacher's efforts. (3) Visual aids developed in cooperation with TV production staffs contributed as much as and, in many instances, more to student learning than did visuals prepared by the teacher alone. (4) The results suggest that TV-centered techniques such as superimposition in themselves do add materially to student learning, and particularly so in conjunction with other relevant production techniques. *—W. H. Allen*

Strevell, Wallace H.

High School Physics by Television: The Houston Area Project. Houston, Texas: University of Houston; September 1960. 32 p. (USOE Project No. 306; University Microfilms Pub. No. 61-3609)

Purpose: (1) To study the effectiveness of TV teaching under varied conditions of school organization and student characteristics such as urban-rural, segregated schools, and homogeneous grouping. (2) To investigate certain selected administrative and instructional practices.

Procedure: Method. A year-long physics course was telecast three days a week over the University of Houston TV station, KUHT, to regular high school classes. Instruction during the remaining two days of the week was by the regular classroom teachers. Comparisons were made between (1) TV-taught heterogeneously-grouped and homogeneously-grouped classes, (2) TV-taught and traditionally-taught classes of both groupings, (3) TV-taught classes in city and rural areas, (4) students in segregated white and Negro schools under the above conditions, and (5) a number of student characteristic variables. Various conclusions were drawn from the experience in administering the TV instructional program.

Statistics. Analysis of variance was applied, and significant differences among the means were noted with the *F*-test and significant differences between the means with the *t*-test.

Subjects. Although about 1200 students (in 29 independent school districts and 53 physics classes) participated in some phases of the experiment, the final conclusions were based upon 186 full-time TV-taught students and 236 matched students taught in traditional (control) classes. Of these 422 subjects, 160 were Negroes, 262 were white; 152 were in rural schools, 270 in city schools; 192 in homogeneously-grouped classes, and 230 in heterogeneously-grouped classes.

Test Measures. Early in the year students were given the *Iowa Physics Aptitude Examination* and the *Otis Gamma Quick-Scoring Mental Ability Test.* At mid-term the *Outterson Mid-Term Physics Test* was administered. The *Dunning Physics Achievement Test* was given at the end of the year. All tests were administered to experimental and control groups.

Results and Conclusions: (1) The TV-taught high school classes achieved equally as well as the traditionally-taught control classes. (2) There was evidence that TV-taught homogeneous classes were more effective than TV-taught heteroge-

neous classes, making greater gains in achievement in relation to ability and having a more positive attitude toward televised instruction. (3) The TV-taught rural classes made as much progress as the control rural classes. (4) The TV-taught Negro classes made more gains than white classes in terms of original aptitude. "It appears on the whole that television teaching was an advantage for academically underprivileged groups." (5) A favorable teacher attitude toward TV and the project was found to accompany larger gains in student achievement in TV-taught groups. (6) No significant differences in student gain was discovered due to intellectual ability, class size, level of school district expenditures for education, pupils attitude toward TV, quality of laboratory facilities, student prerequisites in science, student load, or the quality and amount of teacher training. (7) Telecast instruction was concluded to be one of the most rapid and effective supervisory means to bring improvement of curriculum content and teaching methods in the schools. It also promises quick results in instituting new course content and sets a standard in careful and accurate preparation of lectures, demonstrations, and other content.

—W. H. Allen

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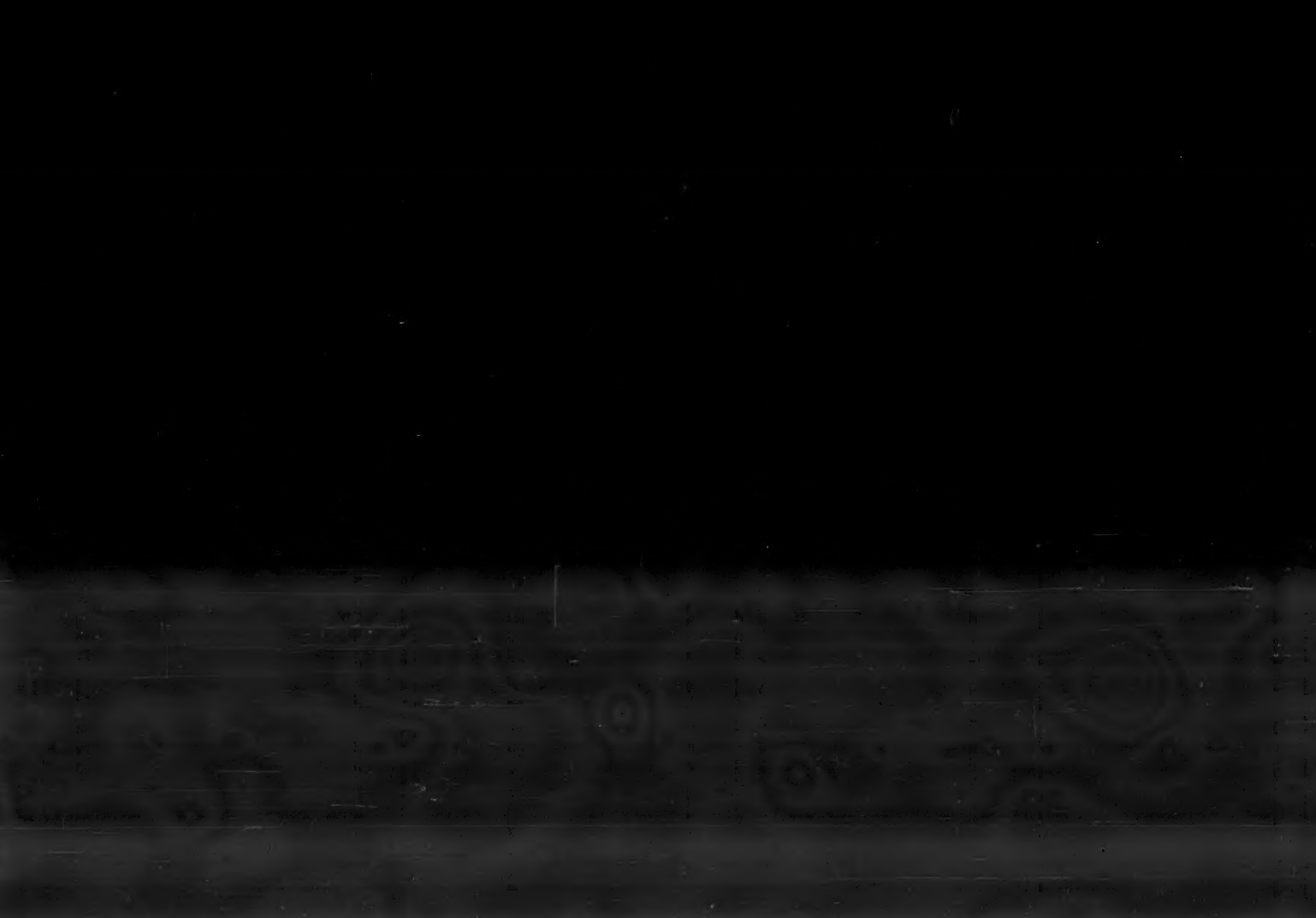
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